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IN THE

Supreme Court Of The United States

OCTOBER TERM, 1970

NO. 48 Original

STATE OF MISSISSIPPI ..... *Plaintiff*

vs.

STATE OF ARKANSAS ..... *Defendant*

ANSWER

RAY THORNTON
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TRIVATHAN PRINTING COMPANY, NEWPORT, ARKANSAS

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ANSWER 1

CERTIFICATE OF SERVICE 3

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STATE OF MISSISSIPPI ..... *Plaintiff*

VS.

STATE OF ARKANSAS ..... *Defendant*

ANSWER

Comes the State of Arkansas by and through the Attorney General and for its answer to the complaint of the State of Mississippi, respectfully states:

1. That it denies that the jurisdiction of this Court is properly invoked.

2. That it admits the material allegations of paragraph 2 of the complaint.

3. That it admits the material allegations of paragraph 3 of the complaint.

4. That it admits the material allegations of paragraph 4 of the complaint.

5. That it denies each and every material allegation of paragraph 5 of the complaint.

6. That it denies each and every material allegation of paragraph 6 of the complaint.

7. That it has no knowledge of the allegations contained in paragraph 7 of the complaint and consequently can neither admit nor deny those allegations.

8. That it denies each and every material allegation of paragraph 8 of the complaint.

9. That it denies each and every material allegation of paragraph 9 of the complaint.

10. That it denies each and every material allegation of paragraph 10 of the complaint.

11. That it denies each and every material allegation of paragraph 11 of the complaint.

12. That it denies each and every material allegation of paragraph 12 of the complaint.

13. That it denies each and every material allegation of paragraph 13 of the complaint.

WHEREFORE, defendant State of Arkansas prays that the complaint herein be dismissed, or in the alternative, that this Court find that the subject lands are within the territorial boundaries of the State of Arkansas, for its costs, and for all further proper relief.

Respectfully submitted,

RAY THORNTON
Attorney General

WILLIAM DREW
Special Assistant Attorney General

MIKE WILSON
Deputy Attorney General
Justice Building
Little Rock, Arkansas 72201

CERTIFICATE OF SERVICE

I, Mike Wilson, do hereby certify that I mailed a copy of the foregoing Answer to Honorable Albioun F. Summer, Attorney General, State of Mississippi, Jackson, Mississippi, Honorable Delos H. Burks, Deputy Attorney General, State of Mississippi, Jackson, Mississippi, and Honorable Mitchell Emmett Ward, Special Counsel to the Attorney General, State of Mississippi, Suite 500 Merchants National Bank Building, Vicksburg, Mississippi, attorneys of record for plaintiff, with postage prepaid attached thereto on this the 20th day of February, 1970.

/s/ MIKE WILSON

MIKE WILSON

IN THE

Supreme Court of the United States

NO 48, ORIGINAL

October Term, 1970

STATE OF MISSISSIPPI, Plaintiff,

v.

STATE OF ARKANSAS, Defendant.

REPORT OF SPECIAL MASTER

CLIFFORD O'SULLIVAN
Senior Circuit Judge
Special Master

THE INLAND PRESS, DETROIT, MICHIGAN

IN THE

Supreme Court of the United States

NO 48, ORIGINAL

October Term, 1970

REPORT OF CLIFFORD O'SULLIVAN, SPECIAL MASTER

STATE OF MISSISSIPPI, Plaintiff,

v.

STATE OF ARKANSAS, Defendant.

REPORT OF CLIFFORD O'SULLIVAN, SPECIAL MASTER

To the Chief Justice and Associate Justices of the Supreme Court of the United States:

This is an original action brought in the Supreme Court of the United States by the State of Mississippi against the State of Arkansas to resolve a dispute as to the true boundary line between those states. The undersigned was appointed Special Master to hear the relevant proofs and make report to the Supreme Court.

In the area involved, the Mississippi River forms such interstate boundary and the river was such boundary at the time these states were, respectively, admitted to the Union in the first half of the nineteenth century. It is not disputed that the river has migrated westerly approximately one-half mile from its location in the years 1823

and 1830 — the years that the first Government Land Office surveys were made of the litigants' respective boundary lines in this area. Mississippi claims that the river's westward migration was the consequence of the caving of its western bank (the Arkansas side), and the gradual depositing of alluvial accretion on its eastern bank (the Mississippi side), thereby forming what is known as a point bar. Arkansas claims that such westward movement was the product of an avulsion whereby the river suddenly and violently jumped its western bank and found a new course on the mainland of Arkansas, and carved therefrom a piece of such mainland, forming an island in the river on its eastern side which, with accretions thereto, is identified as Luna Bar. It is Arkansas' claim that this avulsion occurred as a single and sudden event between the years 1871 and 1872. If the migration of the river came about by the gradual movement claimed by Mississippi, the land identified as Luna Bar became and remains a part of the State of Mississippi. If, however, the westward movement of the river came about in 1871 from an avulsion, as claimed by Arkansas, the interstate boundary remains substantially as it was immediately before the claimed avulsion of 1871, and Luna Bar and accretions thereto are a part of Arkansas. In 1935 the United States Corps of Engineers dug a new channel for navigation in the relevant area, identified as Tarpley Cut-Off. After this became the main navigation channel, the old course of the river fell into disuse.

The area of contest will be more clearly disclosed by examination of Plaintiff's Exhibit 1, [Appendix A] attached hereto. This exhibit shows Luna Bar lying to the east of that part of the river identified as Spanish Moss Bend. Prior to the creation of the Tarpley Cut-Off, Spanish Moss Bend was the thalweg, or the deepest part, of the

navigable river — going around the westerly side of Luna Bar. The extent of the westward migration of the river is disclosed by examination of two black lines proceeding through Luna Bar, agreed to be the meander lines of the river in 1823 and 1830, respectively. Those who prepared Exhibit 1 in 1935 located the interstate boundary line as being in Spanish Moss Bend, and portray Luna Bar as being a part of the State of Mississippi. The delineations and identifications on this map substantially sustain the contentions of Mississippi in this litigation. Exhibit 1 is entitled "Refuge Ark-Miss 1939" and is identified as being the product of the War Department, Corps of Engineers, and recites that it was "Prepared under the direction of the President, Mississippi River Commission." None of those who made the underlying surveys and prepared Exhibit I appeared as witnesses in this case. I emphasize that this exhibit was completed and became an official record of the Corps of Engineers years before contest over the correct interstate boundary came into existence. Experts called by Arkansas made no attempt to expose any fault in Exhibit 1, or to impair its corroborative worth, other than to say they considered it to be erroneous. I consider it as very strong, though not conclusive, evidence supporting the claims of Mississippi. A witness called by Mississippi, Austin B. Smith, prepared Exhibit 2 [Appendix B] which is substantially a duplicate of Exhibit 1. Attached to Exhibit 2 is an appendix setting out the exact courses and distances of the line that the plaintiff claims is the correct interstate boundary. Such Exhibit 2 and its appendix are attached as part of this report.

The cause of the western migration of the Mississippi River is a question of fact, resolution of which will be dispositive of this lawsuit. This question has twice been

resolved in private litigation in favor of the claim of Mississippi. In *Anderson-Tully Company* v. *Walls*, 266 F. Supp. 804 (N.D. Miss. 1967), the late Judge Claude F. Clayton of the United States Court of Appeals for the Fifth Circuit, then a District Judge, wrote an extensive and able opinion setting out the applicable law and resolving whatever issues of fact were presented by the evidence. He found that Luna Bar was initially alluvial land created by gradual accretion to the Mississippi side of the river. The law is undisputed that if such is the case, the land so formed becomes, and remains, a part of the state upon whose side of the thalweg of the river the accretion took place. If in this process the river's thalweg moves, the new location of the thalweg becomes the interstate boundary. It is agreed that construction of Tarpley Cut-Off in 1935 was a man-made avulsion and, as such, did not effect any change in the interstate boundary. Judge Clayton's decision was not appealed.

The brief of the State of Mississippi correctly states the applicable rules as follows:

> "Both states agree to the legal principle that when a navigable river constitutes the boundary between two states, the middle of the main channel of the stream constitutes that boundary. This 'middle of the main channel' has been variously defined as the thalweg or the sailing channel, being that channel customarily followed by navigation.
>
> "Both states also recognize the rule of law that where the course of a boundary stream changes through the operation of the gradual processes of erosion and accretion, that the state boundary follows the stream and remains in the varying center of the navigable channel.
>
> "Both states, we understand, also concede that

> where a boundary stream suddenly abandons its old bed and seeks a new one, such change, termed in the law 'avulsion', works no change in the boundary, but in such instance the boundary remains fixed in the middle of the old navigable channel when it last ceased to be a flowing stream."

Arkansas concedes the validity of the foregoing and in its brief here, observes:

> "The evidence presented by the State of Mississippi certainly raises a presumption that the thalweg of the Mississippi River migrated westward, erasing the intervening land, thereafter forming accretions to Carter Point, Mississippi."

With this concession, and it is a correct one, the burden was on Arkansas to overcome the evidence supporting Mississippi's position and establish that the final position of the Mississippi River in Spanish Moss Bend was the product of an avulsion — a sudden "jumping" of the river to establish, enter, and thereafter to flow in a new channel. Arkansas' concession of a presumption that Luna Bar came into being as a result of accretion was recently reasserted by the Supreme Court of Arkansas in the case of *Pannell* v. *Earls*, 483 S.W. 2d 440, 442 (1972), where the Court said:

> "A riparian owner of land in Arkansas who undertakes to prove Arkansas title to land on the east shore of the Mississippi River, has a considerable burden in proving that the land was severed from Arkansas by sudden avulsion. This is true because there is a strong presumption in favor of the permanency of land boundary lines. See Wyckoff v. Mayfield, 130 Or. 687, 280 P. 340 (1929), 9 C.J. §300. Furthermore, *when land lines are altered by the movement of a stream, the weight of authority, both state and federal, appears to recognize a strong presumption, founded on long experience and observation, that*

> *the movement occurs by gradual erosion and accretion rather than avulsion.* United States Gypsum Co. v. Reynolds, 196 Miss. 644, 18 So. 2d 448 (1944); Darthmouth College v. Rose, 257 Iowa 533, 133 N.W. 2d 687 (1965); Kitteridge v. Ritter, 172 Iowa 55, 151 N.W. 1097; Bone v. May, 208 Iowa 1094, 225 N.W. 367." (Emphasis supplied.)

The earlier case of *Arkansas Land and Cattle Co.* v. *Anderson-Tully Co.*, 452 S.W. 2d 632 (1970), involved the same issue as is before me. It was an action by an Arkansas land owner to quiet title to most of the land known as Luna Bar. The defendants, claiming that Luna Bar was in Mississippi, moved to dismiss the suit on the ground that the Arkansas Court was without jurisdiction of the subject matter. The trial court in Chicot County, Arkansas, took extensive evidence on the conflicting claims and sustained the motion of the defendants on the ground that Luna Bar was in fact in Mississippi and that the Arkansas court was without jurisdiction. The Supreme Court of Arkansas reversed the trial court by a four to three decision on the ground that the trial court should reconsider whether the Mississippi claimant to Luna Bar had clearly met its burden. It considered that such court had failed to give adequate consideration to the testimony of one James P. Spillers, an expert called by Arkansas. The majority opinion of the Arkansas Supreme Court recites Spillers' position[1] to be:

---

[1] At the trial before the undersigned Special Master, the witness Spillers testified that the avulsion which caused the Mississippi River to "jump" to a new channel severing Luna Bar from the mainland of Arkansas, was a single event occurring some time between 1871 and 1872. In the Arkansas trial, as recited by the majority for the Arkansas Supreme Court, Spillers said that the change in the river channel was accomplished, by avulsion, over a period of twelve years from 1862 to 1874. This theory does not fit the sudden avulsion now claimed.

> "[T]he formation of Luna Island could only have been the result of an avulsion of the Mississippi River *between 1862 and 1874* rather than of the gradual process of erosion and accretion, and that the island is a remnant of the Arkansas mainland to which there have been accretions." 452 S.W. 2d at 639. (Emphasis supplied.)

Such majority opinion ends with a remand to the trial court "for further proceedings." Such cause was pending in the Arkansas trial court when this suit was started as an original action in the Supreme Court. A stay of the Arkansas proceedings was granted until the decision here is rendered, it being agreed that:

> "The Supreme Court of the United States is the only forum to settle this dispute, fix the boundary line between the states, and determine finally the rights of the parties. See *Florida* v. *Georgia*, 17 How. 478 (1855); *Oklahoma* v. *Texas*, 258 U.S. 574, 66 L.Ed. 771, 42 S.Ct. 406 (1922); *Texas* v. *Florida*, 59 S.Ct. 563, 306 U.S. 398, 83 L.Ed. 817, 121 ALR 1179 (1939)." (Orig. brief of Miss. in S. Ct. p 12).

In all of the trials which involved the basic question as to the location of Luna Bar, Arkansas relied upon two general lines of proof. First, there was testimony by foresters produced by Arkansas purporting to establish that there was evidence of timber growth on Luna Bar of such antiquity that such bar must at one time — an ancient time — have been a part of the mainland of Arkansas, and that after its violent separation therefrom, accretions then expanded Luna Bar to its present size. With some variations and additions, testimony as to the vegetation and the trees and the evidence of their antiquity was repeated to me as Master. Most of this evidence was before Judge Clayton in the United States District Court, and before the Chancellor in

the trial in Arkansas. Of this Judge Clayton said:

> "Defendants [Arkansas] made an earnest effort to refute the forestry evidence offered by plaintiff [Mississippi]. Within the area involved here their witnesses had located and taken pictures of eight trees (a sycamore, ash, pecan, mulberry, hackberry (2), box elder and sweet gum), which were claimed to be of such sizes and ages as to be incompatible with the theory of plaintiff as to the age of the bar and the development of the forest growth thereon, since it takes about 50 to 70 years for the pioneer forest to mature before the secondary species takes hold. The existence of hardwood trees on the bar was established by other witnesses for the defendants. However, the ages of these trees which could be established from a ring count was consistent with plaintiff's theory and the location of the other trees in the disputed territory is not at all inconsistent with the progressive development of a forest on lands such as those in dispute here. It must be borne in mind, as aforementioned, that there always is some overlapping between pioneer and secondary species and between secondary and tertiary or climax species. It is not at all unusual, especially where openings occur in a pioneer forest through logging operations or otherwise, for seeds of the secondary and tertiary species to be washed in, take hold, and grow.
>
> "In sum, the weight of the evidence as to vegetation is that the bar is overwhelmingly composed of the pioneer species, but with scattered isolated trees of the secondary group, and an occasional young tree of the climax species." 266 F.2d at 810.

The Supreme Court of Arkansas said:

> "Considerable significance is accorded by both parties to findings of foresters as to vegetation, its

> age and history. We agree with the chancellor that no weight can be accorded to this testimony because it and the interpretations given it are in such conflict that it is inconclusive. It would not be possible to say, on the present record, that a chancellor's finding on this important factor was against the preponderance of the evidence. If the trial court's findings had rested on this factor, we could only affirm its decree." 452 S.W. 2d at 640.

I was not persuaded that the evidence before me was of such additional weight as to impair the quoted findings of Judge Clayton. I think it is right to set out here the findings of fact that were made by the Arkansas Chancellor.

> "1. The area occupied by Luna Bar was within the boundaries of Sections 9 and 16 owned by appellant when the United States Government Survey dated January 13, 1825, and certified June 18, 1823, was made.
>
> "2. Luna Bar appeared in the river sometime between the year 1862 and the years 1872-74.
>
> "3. The thalweg, or sailing channel, of the Mississippi River lay west of Luna Bar for more than 40 years prior to 1961.
>
> "4. That the proof is insufficient to show that the Mississippi River 'land jumped' and left Luna Bar isolated from appellant's lands remaining in Sections 9 and 16 on the mainland.
>
> "5. That the thalweg or sailing channel west of Luna Bar existing from 1872/74-1935 came into existence, by reason of erosion and accretion." 452 S.W. 2d at 634.

The majority opinion in the Supreme Court of Arkansas went on to say:

> "We find ample testimonial support for the first

two of the chancellor's findings listed above. As a matter of fact there seems to be little controversy on these points. Insofar as the other findings are concerned the critical question depends upon location of the river channel between 1861 and 1872/74 and the means by which any change of location was accomplished." 452 S.W. 2d at 635.

The testimony at the hearing before me relevant to vegetation and age of trees was, as far as I can tell, reasonably comparable to the earlier cases. Mississippi presented forestry experts who described the forest on Luna Bar as one predominantly made up of pioneer species of trees with small scattered areas of secondary and climax trees. The age of the trees as given by these witnesses is consistent with the first appearance of growth on Luna Bar as depicted by the early Mississippi River Commission Charts. These charts showed Luna Bar to be a barren sand bar, with no vegetation.

Arkansas took the position that the stand of trees on Luna Bar was composed of second generation trees that had sprouted from stumps that had been killed off by flooding and deposits of alluvium that covered the ring collar of these once live trees, killing only the tops. However, Arkansas' forestry experts did concede that an actual forest does not have to follow a set timetable and that trees of the secondary and climax species can begin to grow along with those of the pioneer species. At the current hearing several pieces of wood were identified as, together, constituting a tree stump that one of Arkansas' forestry witnesses said had been found "in place" on part of Luna Bar. That is to say, it was dug out of what was claimed to be its place of growth as a living tree. Part of the stump was given to a nuclear physicist, Dr. Iddings of the faculty of Loui-

siana State University, who, by letter admitted in evidence, said:

> "The wood sample you have recently made available to me (identified as mulberry from island) has been dated using the method of Noakes, et al. The age of the wood is 555 plus or minus 180 years."

I point out that Dr. Iddings made no attempt to support Arkansas' claim that the involved wood was in fact taken from a tree that had its place of birth and growth in the soil of Luna Bar. One of Mississippi's experts was recalled and pointed out that at the point where this stump was allegedly found in 1972, the elevation of Luna Bar was at least 10 to 15 feet above what it was in 1882. Therefore, a tree of the antiquity of the one in question would have been deep in the undersoil of Luna Bar and not on its surface at the recent time of its claimed removal from Luna Bar. It was the position of Mississippi that various stumps found on Luna Bar and Spanish Moss Bend had been brought there by flood waters. Its position in such regard was sustained by the courts heretofore considering the matter. I do likewise.

At the hearing before me, Mississippi produced various experts to sustain its position. Dr. Charles R. Kolb is Chief of the Geology Branch of the Waterways Experiment Station. He is a resident of Vicksburg where the Research Laboratory of the United States Corps of Engineers is located. He presented an impressive academic background —a graduate of Louisiana State University, a Bachelors Degree in Science with a major in geology and a minor in soil mechanics. He took additional studies at Purdue University, the University of California at Berkley, at George Washington University in Washington, D.C. He obtained a B. S. Degree from LSU in 1948 and his M. S. in 1950 after

working at various jobs having to do with geology. He got his Ph. D. from LSU in 1960. Substantially all of his studies and work were in the science that is controlling here. His present position as Chief of the branch of the U. S. Corps of Engineers at Vicksburg, having primarily to do with the Mississippi River Delta, gives strength to his qualifications to express an opinion in the contest before me. His research extended back to, and included, materials having to do with the history of the Mississippi River from the beginning of the 19th Century — historic maps, former geological studies of the area, and his own on-the-ground examination. This witness' testimony reduced to its essentials, was that Luna Bar was formed in keeping with the geological history of the Mississippi River Delta which he described as a meandering alluvial stream. He said:

> "A stream such as the Mississippi and many other alluvial streams, if you straighten it, will begin to develop a sinuous pattern in very short order. It will begin to cut at one bank and to fill at the point opposite that bank." [Tr. 266]

Supported by drawings made from his studies of the Mississippi River, he further said:

> "It [the flowing water of the river] cuts at that concave bank [the Arkansas side of the river] you see there and it builds at the Point Bar. [Luna Bar was identified as a point bar.] In other words, there are accretions that form at that Point Bar and as it builds out the opposite bank, the concave bank, retreats toward the left [the Arkansas bank]." [Tr. 267]

There was no disagreement that over the history of this area the force of the Mississippi was always against the Arkansas bank, which would be conducive to a caving away of such bank. The alluvium that accreted to what is identi-

fied on all the maps as Carter Point was not from the cavings of the Arkansas bank. The soil in the form of alluvium was carried downstream and was deposited at points below the area we deal with. The alluvium which attached to Carter Point would more likely come from cavings above it, carried down to Carter Point in the flow of the river. I see no point in attempting a full and scientific analysis of Dr. Kolb's testimony. His was a simple and clearly worded account of the formation of Luna Bar and was consistent with the changing course of the river and the alluvial deposits and accretions that formed the so-called "bars" throughout the alluvial delta of the Mississippi River. The word "bar" is a word of art in the relevant science and has over the history of the Mississippi River been applied only to formations that are the consequence of the accretive process described by the witness and, consistent with the law earlier set out, there is a presumption that such a formation as Luna Bar was an accretion to the side of the thalweg of the river upon which it forms. Perhaps because of their awareness of this, Arkansas avoided using the word "bar" and at all times referred to the area in question as Luna *Island*.

While on Exhibit 1 Luna Bar appears to be separated by a body of water or stream between the bar and the mainland of Carter Point, the existence of this was fully explained by Dr. Kolb to be the result of some scouring out of the alluvial formation at flood time[2]. It was shallow and not navigable. The records examined by Dr. Kolb establish that

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[2]Dr. Kolb in Plaintiff's Exhibit P-75 depicts the thread of maximum surface velocity during a flood stage of a river. Such velocity as shown is hard against the convex bend and as a direct result helps the river to shorten its course during such flood stages by way of neck cut-offs and chute cut-offs.

at all times before construction of Tarpley Cut-Off this pointway channel was shallow, whereas the deep and navigable part of the river was against the Arkansas side in Spanish Moss Bend.

As to the contention of Arkansas that Luna Bar came into being in 1872 as the result of an avulsion — a sudden and violent shift in the location of the deep or navigable part of the river — Dr. Kolb went on to say that while there have been avulsions in the Mississippi River Delta, they came about where the river cut through a neck of land, thus shortening its course. He said that what Arkansas' proofs claimed to be an "outside avulsion" was wholly unknown in the history of the river. He said:

> "One of the things I think I should stress in this business of outside avulsions * * * because many of the things I have to say are directed at this particular contention, if you will, of the State of Arkansas that Luna Bar was formed by what I would call an outside avulsion. I had to actually dream up the term because in my twenty-five years of experience with the river I don't know of a situation where the river actually left the main course and avulsively — suddenly — changed, went through the outside bend and then reentered that outside bend, lengthening its course. You see, when it does that it lengthens its course. All the avulsions I know of — and there have been literally hundreds, perhaps even thousands, throughout the Mississippi River — have all happened when the river shortened its course by cutting across through a bend, a neck, a narrow neck of land." [Tr. 268]

Dr. Kolb rather forcibly reiterated his contention in this regard as follows:

> "I said the words 'outside avulsion' is something, I guess, I coined. I don't remember anyone else using

that, it isn't in the geologic literature. No one has ever conceived, to my knowledge, such a thing occurring." [Tr. 269]

He asserted that an outside avulsion was impossible.

Supportive of Mississippi's contention, Dr. Kolb's studies of geological and unchallenged government records disclosed that from the first time that the relative elevations of the Arkansas side of the river and that of Luna Bar were recorded, the Arkansas bank was 128 feet M.S.L., whereas until fairly recent times Luna Bar was much lower at 113 feet M.S.L[3]. This conflicts with Arkansas' claim that Luna Bar had a beginning as a piece of the mainland of Arkansas, separated from such mainland when the river avulsively formed a new channel leaving a piece of Arkansas mainland as an island in the river which then grew by accretion. The present elevation of Luna Bar is the result of gradual building which was still continuing as of 1925, but ceased, according to the M.R.C. Surveys, in the late 1930's.

Dr. Kolb included in his investigation a comprehensive study made by the late Dr. H. H. Fisk, then of the faculty of Louisiana State University, published in 1944. The eminence of Dr. Fisk as a geological authority upon the history of the river is not questioned. The study portrays the sinuous meanderings of the Mississippi River over many centuries. Some of this study was, of course, speculative, but was based upon unchallenged assumptions. Some of the

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[3] The first hydrographic survey of the Mississippi River in the area in question is Mississippi River Commission [M.R.C.] Chart 39, 1879-80, Plaintiff's Exhibit P-30. The references to elevation on this and later charts is in terms of Memphis Datum which is approximately 6.9 feet greater than Mean Sea Level. The change from Memphis Datum to M.S.L. occurred sometime after 1918.

portrayals of the Fisk study were plotted with the aid of soil borings disclosing the locations of so-called clay plugs, discussed below.

The position of Arkansas, in explaining how the Mississippi River was able to avulse into the position of Spanish Moss Bend in the year 1872, was that it then found an old, deep, but formerly abandoned channel on the Arkansas mainland which permitted the river to adopt it as a new channel then suddenly acquired. Using the Dr. Fisk study, Dr. Kolb testified that when a former channel is abandoned by the meanderings of the river, there are formed what Dr. Fisk identified as clay plugs, ranging from depths of 34 to 75 feet, occupying what had been the river's channel. Without this writer attempting geological exposition of Dr. Kolb's use of Dr. Fisk's study, the following exchange between Dr. Kolb and myself may be a fair summary of the significance of the reference to clay plugs:

> "THE MASTER: * * * Now, then, if at the time we begin this investigation when these two states became such, if this had been an avulsion after that, which reached over and embraced a part of Arkansas, then it is an important inquiry as to what is the nature of the soil in Luna Bar — if it is an entirely distinct species from that in Arkansas. That is what you are saying.
>
> "A. That is precisely what I am saying. In other words, this area here does not show a continuation of this plug that has now been cut off by outside avulsion. There is no such plug shown here on Luna Bar. This is essentially what I would like to show in the next two exhibits." [Tr. 314]

Dr. Kolb further summarized his rather extensive testimony as follows:

> "Could I summarize in this way: That all of the

geological studies that have been published and the one that was unpublished, indicate that Luna Bar is simply a part of accretionary topography attached to Carter Point and that it has been accretionary deposit throughout its history." [Tr. 316]

At the conclusion of his direct testimony, Dr. Kolb summarized his conclusions and gave the reasons he assigned in support of them:

"1. Luna Bar is one of the many detached Point Bars which form as a part of the normal accretion to Point Bars at migrating meander loops along the Mississippi.

"2. No avulsion of the course of the river was involved in its formation.

"3. The only avulsion which affected the Luna Bar area was the one which resulted from Tarpley Cut-off made by the Corps of Engineers in 1935. This avulsion fixed the boundary between Arkansas and Mississippi along the pronounced thalweg in Spanish Moss Bend west of Luna Bar.

"4. All published geologic studies which include Luna Bar indicate it to be a Point Bar deposit formed by normal accretion to a convex bend of the river.

"5. A study of available mass indicates that Luna Bar came into existence sometime between 1864 and 1872. The first location of Luna Bar was upstream and east of its present position. Accretions have continued to form on the west side of Luna Bar.

"THE MASTER: Doctor, will you go back: You said Luna Bar came into existence between what years?

"A. 1864 and 1872.

"6. The thalweg of the channel was west of Luna Bar and hard against the Arkansas bank throughout the history of active bend development.

"7. There is no evidence that an outside avulsion occurred which isolated a portion of Luna Bar and left it untouched by subsequent river migration. Arguments against such a possibility are:

(a) Outside avulsions are not known to occur on the Mississippi River and, to my knowledge, have not occurred on other meandering rivers.

(b) Avulsions always shorten rather than lengthen the path of the river. They are initiated during flood flows when the thread of greatest surface velocities hugs the convex rather than the concave side of the bend. Accretions to Point Bars lengthen the path of the river; avulsions shorten this path.

(c) An outside avulsion, if such were possible, would have required the free existence of a channel capable of carrying low water flow out of the main channel at one end and back into the main channel at the other. Such a channel would have had to be so well established and prominent that it would have been recorded on the maps of that time. No such channel is shown on existing maps. Moreover, the avulsion would have had to cross the prominent natural levee on the Arkansas bank and somehow reenter the Mississippi through this natural barrier.

(d) The outside avulsion at Luna Bar was supposed to have occurred between 1864 and 1872. The 1872 map shows a full channel with no middle bar at this point. The lower tip of the then recently formed Luna Bar was upstream of the area under contention, and a considerable distance upstream from the lower tip of the present Luna Bar.

"And finally,

(e) If an outside avulsion had occurred, it would have left behind a segment of the old flood plane which had once been the Arkansas bank. The eleva-

> tion of the flood plane here, or the Arkansas bank here, is on the order of 135 feet Mean Sea Level. Comparison of bank line and Hydrographs shows that in 1872 the area under contention was near the deepest part of a full flow channel, and from 1882 to 1913, Luna Bar had built to an elevation of only about 123 feet above Mean Sea Level." [Tr. 354-357]

No cross-examination of Dr. Kolb was attempted.

He was a qualified and impressive witness and I rely on his conclusions to support by factual findings hereinafter detailed.

Another witness called by Mississippi to support its contentions was Austin B. Smith, an engineer in private practice, presently living in Vicksburg, Mississippi. He described himself as a potamologist. His qualifications were challenged here as they were when he was a witness at the United States District Court trial and the hearing in the Arkansas Chancery Court. Both of these courts accepted him as an expert and such ruling was approved by the Supreme Court of Arkansas. I likewise recommend his acceptance as such in this case.

Austin B. Smith was a 1930 graduate of the University of Arkansas in Civil Engineering, with a minor in geology. Following graduation, Smith worked for a brief period for the Missouri Highway Department and beginning in August of 1930, the year of his graduation, he became connected with the United States Corps of Engineers at Vicksburg, Mississippi. In 1935 he went to work for the Mississippi River Commission and remained with them some thirty-five years, when in 1970 he elected to enter private practice.

Notwithstanding the failure of Mr. Smith to pursue the acquisition of further degrees — doctorates and the like

— as is the wont of recent times — in this writer's view his work experience presents values whereby to measure his relevant qualifications, at least equal to possession of further academic honors.

I set out in detail some of his work experience because of its special relevance to the technical problems of the case before me and because of my herein expressed confidence in its value in the resolution of this contest. He returned to Vicksburg in 1930 and was assigned to the Hydraulic Branch of the Corps of Engineers. He then went into the Soils Laboratory, and then into the field office at Lake Providence, Louisiana. There he worked on Hydraulic Surveys, dredging and other field activities such as revetment surveys and the construction of pile dikes. In 1933 he was transferred to the Vicksburg office of the U.S. Corps of Engineers in the dredging and navigation branch. In 1934 the Corps was engaged in enlarging the levees and in making cut-offs on the Mississippi. In 1935 he was transferred to the Mississippi River Commission. This Commission has jurisdiction of the Mississippi from Hannibal, Missouri, to the Gulf of Mexico. Smith was first an assistant to the Chief of Hydraulics, then became Chief of the Dredging and Navigation Branch.

He said that potamology is the science of rivers. In 1942 Smith was appointed to the first Potamology Board of the Mississippi River Commission. He was responsible for review of the specifications for the construction of the Memphis, Vicksburg, Greenville and Baton Rouge harbors. He was a Fellow of the American Society of Civil Engineers, a member of the Mississippi Society of Professional Engineers, the National Society of Professional Engineers, the Society of American Military Engineers, a member of the Permanent International Association of Navigation

Congresses and the American Congress of Surveying and Mapping and is listed in Who's Who in Engineering. He said he worked on the Mississippi River some 40 years and had become acquainted with every phase of action of the river such as cut-offs, bar building, bank cavings and sedimentation.

Aside from formal objection that Smith was not a qualified expert, no challenge was made by Arkansas to the correctness of the above recital of his experience.

The witness Smith went on to account for the formation of Luna Bar as an accretion to Carter Point, a large land mass lying to the east of Luna Bar and appearing on Exhibit 1, attached hereto. Smith's testimony was that over the years that followed 1823 and 1830, the force of the flow of the Mississippi in the involved area was against the Arkansas bank and there was much caving of the Arkansas bank with the consequent migration of the river westerly and a contemporaneous accretion to Carter Point on the Mississippi side and the ultimate formation of Luna Bar. On Exhibit 1 there appears a body of water between Carter Point and Luna Bar. Witnesses referred to this as a pointway channel in contrast to the main course of the river, which is called the bendway. Here the bendway is identified as Spanish Moss Bend. The witness Smith testified that the thalweg of the Mississippi was, at the time Spanish Moss Bend ceased to be navigable, along the dotted line around Luna Bar as shown on Exhibit 1, and that since the creation of the Tarpley Cut-off in 1935 the pointway on the east side of Luna Bar and the bendway on the west, Spanish Moss Bend, are filling up and are no longer navigable. He testified that the water appearing between Luna Bar and Carter Point was no doubt the result of some scouring out of the accreted sand bar and

that at various times in history Luna Bar was attached to Carter Point above the surface of the water by land. This is portrayed by Exhibit P-33, [Appendix C] attached hereto.

Smith's account of the migration of the Mississippi to the west, cutting away the river bank on the Arkansas side and the beginning and ultimate alluvial formation of Luna Bar, was in no sense a speculative theory. He supported his account of the caving of the Arkansas bank of the river by government records which recorded such cavings and the problems that they presented in protecting navigation of the Mississippi. Based upon his own study of government records and recorded Mississippi River history, he prepared an exhibit — Plaintiff's Exhibit 6. On this he showed the westerly line of the Mississippi River in 1823 at a time that the river formed the boundary between Arkansas and Mississippi, and showing the westerly migration of such line, as of various later dates to and including the year 1894. I mention again that the portrayals on the exhibit were not scientific speculations, but were his portrayal of what government, and other, records justified. The authenticity of the records consulted by Smith is not challenged. It was not claimed by Smith that the accretions to Carter Point were made by the material from the cavings in Spanish Moss Bend, but were from upstream caving at places such as Miller Bend and elsewhere, and these caved materials attached and accreted to Carter Point. In the early history of the river there was no such bifurcation of the river as appears on Exhibit 1 — the 1939 map prepared by the Corps of Engineers, and the so-called pointway immediately adjacent to Carter Point came into being, as set out above, as a result of some scouring out of the alluvial accretions to Carter Point.

Arkansas' position is that Luna Bar is made up of a piece of the mainland of Arkansas that was cut off therefrom by an avulsion that occurred as a single sudden event between the years 1871 and 1872, with some accretions to such severed piece of Arkansas. It is true that the most distinct evidence of the appearance of Luna Bar as an accretion to Carter Point appeared upon a map of 1872. However, the witness Smith produced a map identified as Lloyd's 1863 map, which shows point bar accretions attached to Carter Point. This is attached hereto—Pl. Ex. 17, [Appendix D] without its certification. Smith interpreted such disclosure as the genesis of the formation that later became Luna Bar. The witness Smith in his research also consulted documents in the New York Public Library and produced a series of documents identified by their publishers as:

THE

WESTERN PILOT,

CONTAINING

CHARTS OF THE OHIO RIVER,

AND OF THE

MISSISSIPPI

FROM THE MOUTH OF THE MISSOURI TO THE GULF OF MEXICO,

ACCOMPANIED WITH

DIRECTIONS FOR NAVIGATING THE SAME,

AND

A DESCRIPTION OF THE TOWNS ON THEIR BANKS, TRIBUTARY STREAMS, &c.

ALSO

A VARIETY OF MATTER INTERESTING TO ALL WHO ARE CONCERNED IN THE NAVIGATION OF THOSE RIVERS.

BY SAMUEL CUMMINGS.

CINCINNATI:

MORGAN, LODGE AND FISHER, PRINTERS.

1825.

Except one which is called James' River Guide, all of these show the forming of point bars along the meandering shores of the Mississippi. The entitlement of these documents, set out above, makes clear their purpose was to aid the river pilots in navigating the river. Whether the portrayed accretions had appeared above the surface is not stated, and more than likely they did not, but their existence would of course be a hazard to navigation. The river pilots were properly warned of their existence whether above or below the surface of the water. Attached hereto are plaintiff's Exhibits 7 to 11 without inclusion of their titles and certifications, [Appendices E, F, G, H, and I]. They indicate that they were published in Cincinnati, Ohio in the years 1825, 1834, 1841, 1847, and 1856. On some of them the location of Carter Point, the Mississippi land to which Luna Bar is an accretion, was identified by the witness Smith.

As a trier of the fact it is not necessary for me to totally destroy the validity of Arkansas' hypotheses. The burden of persuasion was upon Arkansas and the quite speculative character of the reasoning of its witnesses leaves me unpersuaded. I would come to this conclusion even if the burden of proof was not on Arkansas.

Smith also examined the disclosures of public records from 1872 to recent years and concluded that they supported Mississippi's other witnesses that the vegetation and trees on Luna Bar were consistent with its creation and development as an accretion to Carter Point. These maps depict Luna Bar as a sand bar, devoid of any vegetation. While his general testimony included, in part, his interpretation of the significance of the disclosures of his research, such interpretations were not impaired by cross-examination and were opposed only by the speculative hy-

potheses of Arkansas' witnesses Spillers and Durham, hereinafter discussed.

I find that Smith was a credible, qualified and persuasive witness, and he provided weighty support to Mississippi's contentions as to the correct present boundary line between Arkansas and Mississippi. In my opinion he successfully opposed Arkansas' contention that the westward movement of the Mississippi River was the product of an avulsion.

A witness produced by Arkansas claimed to have observed physical evidence[4] that proved that there were, in early times, human habitations on part of Luna Bar, indicating that Luna Bar came into being as a piece of the mainland of Arkansas, severed therefrom by an avulsion. It is my opinion and holding that contrary evidence overcame the probative worth of such testimony and if a factual issue was made as to whether there was such early human habitation upon the beginning of Luna Bar, I resolve it against the contention of Arkansas.

Having in mind the rule of law that the burden of proof is on a landowner who attempts to claim land by reason that such land was severed from his original tract by a "sudden avulsion," *Pannell* v. *Earls*, 483 S. W. 2d 440, 442 (1972), I move on to consider Arkansas' evidence offered to support its effort to meet such burden. Arkansas' principal witness in this regard was James P. Spillers.

Mr. Spillers has an impressive academic background.

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[4] The witness claimed that on an earlier visit to Luna Bar he remembered seeing the ruins of a chimney, but was unable to locate it on a return visit some years later. At the hearing, however, the witness was not at all certain that this so-called chimney ever existed. The other evidence that he relied upon to base his assumption that Luna Bar had been inhabited was the pattern of certain trees he described as not being native to the area and generally placed near dwellings.

In 1948 after World War II service in the United States Marine Corps, he received a B.S. Degree in geology from the University of North Carolina. After a period of private employment, in 1950 he entered Louisiana State University as a teaching assistant to the then Director of the School of Geology at that school. In 1952 he received a Masters Degree in geology from Louisiana State. He then was employed by Humble Oil Company as a surface geologist and in 1954 was transferred to Hattiesburg, Mississippi, to open a geological office for Humble. While there he taught for three years at the University of Southern Mississippi. His subjects were field geology, stratigraphy and paleontology, a study of ancient life. He mentioned other studies and activities supportive of his presentation as an expert. His qualifications were not challenged.

The witness Spillers' conclusion was that between 1871 and 1872 the Mississippi River jumped or avulsed from the river bed where it has been flowing for many years over onto the then mainland of Arkansas, found an ancient water course and thereafter adopted it as the main navigable channel of the Mississippi River. In this process, a large piece of the mainland of Arkansas was left on the east side of the river's main watercourse. It became, with some accretions, what is decribed in Exhibit 1 as Luna Bar. Notwithstanding my own effort to find in Mr. Spillers' testimony an understandable explanation of the existence, on the mainland, of an old, abandoned water course into which the river in 1871 or 1872 moved, I remain unconvinced that there was any adequate proof of Mr. Spillers' hypothesis that there was such a watercourse to accomodate the westward shift of the river. There was testimony as to the distance the river had moved westward from its position in 1823 to its location after the claimed avulsion

of 1872. Though there was some small disagreement, all of the proofs tended to establish the western bank of the river had moved westerly some 2000 feet from its position in 1823. Thus, if such change was not the product of a gradual migration, the avulsive jump of 1871 had to be of the magnitude of close to one-half mile. Notwithstanding Mr. Spillers' finding of a record that indicated that there was a so-called "great flood" about the time of the claimed avulsion, other records appear to negative the importance of the claimed "great flood."

I set out Mr. Spillers' explication of his theory. It is as follows:

> "My contention is this: That through those several devastating floods, not only high water stage, but as it went down, through a period of time, it cut that channel out, it had many opportunities, and as it came into full floom, the thalweg changed in 1871. That is where we noticed it, that the new thalweg was there. I think some scouring and some assistance was had, and it could have been helped by some of the floods of 1868, and really got in there and tore it up, and this flood of 1871 is where the thalweg came through, sir. I believe that to be the case. All of the factual evidence that I find on the ground, leads me to no other conclusion." [Tr. 929]

Of great importance to me in testing the believability and probative worth of Mr. Spillers' testimony is his concession that he had never heard or read of the occurrence of such a cataclysm as he asserted occurred between 1871 and 1872. The following occurred during his cross-examination by Mississippi counsel.

> "Q. We have talked about a neck cut-off and a chute cut-off; what in nomenclature do they call the type of cut-off you say has happened where the

Mississippi River leaves its bank and goes overbank, leaves its bed and goes overbank, coursing around and coming back into its former bed? What kind of cut-off is that?

"A. That type would be re-occupying a previous existing channel.

"Q. I am not familiar with the term; is that an accepted term in geology or alluvial work?

"A. I have no knowledge as to that particular phrase, no, sir.

"Q. Dr. Kolb testified that he had to coin a word and he coined a word, what did he call it?

"A. Outside avulsion.

"Q. Outside avulsion. What do you call it?

"A. I call it merely the reoccupying of a pre-existing lower channel.

"Q. That, too, is a coined phrase by you?

"A. The river has at different times reoccupied channels, sir.

"Q. I said that, too, is a coined phrase by you?

"A. It is my phrase, yes, I will say that is coined.

"Q. You didn't find it in any literature written on the subject?

"A. The words 'recoccupied channel'?

"Q. That phrase to describe this avulsive process you have talked about?

"A. I haven't researched the literature with that particular thought in mind.

"Q. With the little non-research you have done, you have not run across that phrase before?

"A. Outside avulsion, no, sir.

"Q. The phrase you used?

"A. Reoccupied the channel; I have heard of re-occupying a channel, yes, sir; perhaps not in the manner I described.

"Q. Describing in avulsion?

"A. An avulsion is something that happens within a reasonably sudden period of time.

"Q. Let me ask you again, Mr. Spillers: In the literature have you heard your description of this process used to apply to an avulsive process?

"A. I cannot recall one, sir." [Tr. 951-953]

The foregoing supports the testimony of Mississippi's witness Dr. Kolb who said that there have been avulsions on the Mississippi by which its course was shortened, but there is no history of the river lengthening its course as Arkansas here claims.

Mr. Spillers gave extensive testimony of borings that he had made on the adjacent mainland of Arkansas and on Luna Bar. He argued that the soil found by these borings supported his theory. He testified at great length to expose the relevancy of his findings. While this writer understood the words he employed, their corroborative worth as support for what he was claiming for them remained unclear. Mississippi's evidence disclosed that over the period prior to 1871-72, the westerly or concave bank of the river in the area involved had been caving and that such caving was a cause of concern to the government and efforts were made by construction of artificial levees to slow the progress of the caving. This testimony was supported by historical documents. Mr. Spillers and another Arkansas witness denied that such caving occurred at Spanish Moss Bend prior to the claimed avulsion. These Arkansas witnesses admitted that such cavings along the concave sides of the many curves of the river did take place at numerous other places and they gave no adequate explanation as to why the concave side of the river's curve around Spanish

Moss Bend had been exempted from such traditional process of a meandering river.

I have set out above that the word "bar" has a special significance as applied to the changing direction of the Mississippi. The Corps of Engineers identified the land mass claimed by Mississippi as the product of alluvial accretion as Luna Bar. Mr. Spillers characterized such usage as an error and he, as well as other witnesses called by Arkansas, appeared careful to refer to this area as Luna *Island*. I think it right to mention that Mr. Spillers and another Arkansas witness Dr. Durham frequently combatted exhibits inconsistent with their own hypotheses by assertions that the portrayals of such exhibits were inaccurate or completely erroneous. This disagreement was not limited to exhibits which were prepared for this lawsuit but extended to ancient documents which supported Mississippi's claim.

Arkansas also produced a Dr. Clarence O. Durham, Jr. At the time of hearing he was Professor of Geology and Director of the School of Geoscience at Louisiana State University. He presented a distinguished academic background. In the main, he supported the hypotheses and conclusions of Mr. Spillers. Respectfully, I find the same inadequacies in the probative worth of his testimony as I do in that of Mr. Spillers. Like the latter, Dr. Durham conceded the absence of any reference, in the entire history of the Mississippi River, to such an avulsion as Arkansas relies on in this litigation. He asserted that over its history — ancient and modern — the river had "seesawed" back and forth in its location. Notwithstanding that the river's history contains the record of the establishment by alluvial accretions of point bars and avulsions by which the river shortened its course, such history did not con-

tain any record of the event asserted by him — a so-called "outside avulsion." Dr. Durham's recognition that his conclusion was a departure from the traditional action of the river appears in his cross-examination:

> Q. So from your studies and experience, * * * you would normally expect a concave bend to cave materially into the river and you would normally expect that material to be carried downstream and deposited on the next point below?
>
> "A. Yes, sir.
>
> "Q. You have indicated that this did not happen in our situation in Spanish Moss Bend and, therefore, your whole hypothesis, as I understand it, is based upon an abnormal situation?
>
> "A. That is correct." [Tr. 1022-1023]

He joined the witness Spillers in his conclusion, stating:

> "So it is my interpretation, just viewing the maps, that there was an abrupt shift in the western bank line of the western channel in a one-year interval. In association with this, the island came into being." [Tr. 989]

He, like the witness Spillers, found it necessary to resort to charging error in various of the historical records put in evidence. The speculative character of Dr. Durham's conclusion is further portrayed by this examination:

> "Q. So we have no evidence of a depression on the ground from the government survey notes; we have no evidence of an overbank situation with waters coursing through this so-called swale, how did this avulsion take place, then, Doctor?
>
> "A. I would assume that the high waters scoured out the channel there which had been abandoned on the western side.
>
> "Q. So we start with one basic assumption that

it had to be high water, overbank high water, but you have not been able to establish that?

"A. No, sir.

"Q. We start with the second assumption that there had to be a low swale or former channel, as you expressed it, and you haven't been able to establish that?

"A. I have not, but using the same approach I wouldn't have been able to establish the swale that I can see out there today, the second one over, because these surveyors were not really surveying the topography, they were merely laying out section lines." [Tr. 1033-1034]

A key assumption of the Arkansas position is the alleged availability — in 1871 — of a former abandoned channel probably far to the west of the then Arkansas bank of the river; that about a half mile of the Arkansas mainland was "scoured out" by the rushing water of the river which suddenly became the main navigable channel of the Mississippi River. I find that Arkansas' proof failed to justify a finding that there was such an abandoned channel.

Arkansas produced some government documents in support of its claim that there was no movement or caving of the Arkansas side of the river prior to 1872. The scale of some of these maps was such that a mile would be 1/32 of an inch — about the size of a pencil point. Casting doubt upon the occurrence relied upon by Arkansas is the total lack of any reference to it in the many documents which record the history of the river in the area involved. Arkansas offered evidence to sustain a claim that there had been some habitations on Luna Bar, at some uncertain past time. One such piece of evidence was an aerial photograph taken in 1930. An Arkansas witness, claiming special

skill in reading such photographs, stated that he could observe a path which led to a once existing building indicative of early habitation of Luna Bar. The writer, claiming no special skill in this regard, but possessed of normal vision, could not find what the expert saw, even with the aid of magnifying equipment furnished by the expert.

If the central core of Luna Bar had once been part of the mainland of Arkansas, supporting some human habitation, and there came in 1871 the dislocation of the magnitude claimed by Arkansas, it is hard to believe that such event would not have been recorded in the history of the area. There was none, however.

I have not attempted a complete review of the testimony before me. It added up to six volumes of testimony containing 1152 pages and there were introduced in evidence upwards of 200 exhibits, principally official maps going back more than a century and drawings made therefrom.

I am aware that as Special Master it is not my function to render a decision. My duty is to make a report containing such review of the evidence as I consider justifies my findings of fact. I do not consider that to make the findings I do, it is necessary to totally destroy the validity of Arkansas' contentions. The burden of persuasion was upon Arkansas. Initially Arkansas conceded that Mississippi had met its initial burden, aided as it was by the presumption that the change in the thalweg of the river was the product of accretion. The quite special character of the reasoning of Arkansas' witnesses leaves me unpersuaded that it has met its burden of proof. I make clear also that I would come to this conclusion even if the burden of proof was not on Arkansas, but was on plaintiff Mississippi.

FINDINGS OF FACT

Accordingly, I make the following findings of fact:

1) The thalweg of the Mississippi River is in the abandoned bed of the Mississippi River between the upstream end of Tarpley Cut-off around Carter Point to the downstream end of Tarpley Cut-off around Carter Point as of June 1935 and since.

2) That such is and was the boundary line between the State of Mississippi and Arkansas and that all land in the area here involved lying easterly of the above defined line was and is a part of the State of Mississippi.

3) That Luna Bar is entirely the product of the gradual westward migration of the Mississippi River and that such migration was accomplished by the gradual alluvial accretion to Carter Point.

4) That the body of water appearing on Exhibit 1, and lying adjacent to the westerly side of Carter Point, is a part of the State of Mississippi, having come into being by some scouring out of the alluvial deposits which had accreted to Carter Point. It was and is properly identified as the pointway of the river.

5) That Luna Bar was not the product of an avulsion occurring between the years 1871 and 1872, or at any other times.

RECOMMENDED DECREE

In accord with the foregoing, I recommend the entry of the following decree:

It is ordered, adjudged and decreed:

1. The boundary line between the State of Mississippi and the State of Arkansas in the area here involved is as follows:

In the abandoned bed of the Mississippi River

between the upstream end of Tarpley Cut-off around Carter Point, encompassing Luna Bar, to the downstream end of Tarpley Cut-off, as defined and identified in Plaintiff's Exhibit 2. The courses and distances of the above-described line are set out in Appendix B which is made a part of this decree.

2. That Luna Bar, depicted in Plaintiff's Exhibits 1 and 2, came into existence by accretion to Carter Point and is, and was, a part of the State of Mississippi.

3. The cost of this suit, including the expenses of the Special Master and the printing of this report, have been paid out of a fund made up of equal contributions of the State of Mississippi and the State of Arkansas and has been sufficient to defray all of the foregoing expense. Any costs and expenses incurred beyond the amount so contributed by the respective litigants shall be borne by the State of Arkansas.

The foregoing is respectfully submitted.

Special Master

CLIFFORD O'SULLIVAN

Port Huron, Michigan
March 15, 1973

APPENDIX A

[Mississippi's Exhibit No. 1 — REFUGE ARK.-MISS. 1939 Edition]

FOLD OUT IS TOO LARGE TO BE FILMED

APPENDIX B

[Mississippi's Exhibit No. 2 — Mississippi River Hydrographic Survey 1962-1964 Sheet 26 with Appendix III of Mississippi's Exhibit No. 140]

APPENDIX B

[Mississippi's Exhibit No. 2 — Mississippi River Hydrographic Survey 1962-1964 Sheet 26 with Appendix III of Mississippi's Exhibit No. 140]

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[Mississippi's Exhibit No. 2 — Mississippi River Hydrographic Survey 1962-1964 Sheet 26 with Appendix III of Mississippi's Exhibit No. 140]

APPENDIX III

Arkansas-Mississippi State Boundary looping Carter's Point, including Luna Bar.

The following is a description, by geodetic positions (M.R.C. datum), of the Arkansas-Mississippi State Boundary looping Carter Point, Miss. west of Tarpley Cut-off Channel, including Luna Bar. This boundary, lying between Latitude 33° 22' 43.5" to 33° 26' 25" and Longitude 91° 06' 39" to 91° 12' 32", begins at the head of Tarpley Cut-off channel and runs westward, southward and eastward along the thalweg and last steamboat navigation course in the abandoned Spanish Moss Bend to the foot of Tarpley Cut-off channel.

The said Arkansas-Mississippi State Boundary is described as beginning at the head of Tarpley Cut-off Channel at Point P-36 at Latitude 33° 26' 24" and Longitude 91° 06' 46" (1963-64 Survey);
Thence west to Point P-1, Lat. 33° 26' 25" and Long 91° 07' 30";
Thence southwesterly to Point P-2, Lat. 33° 26' 0.0" and Long. 91° 07' 56";
Thence southwesterly to Point P-3, Lat. 33° 25' 47" and Long. 91° 08' 17";
Thence southwesterly to Point P-4, Lat. 33° 25' 40" and Long. 91° 08' 42";
Thence southwesterly to Point P-5, Lat. 33° 25' 36" and Long. 91° 09' 0.0";
Thence southwesterly to Point P-6, Lat. 33° 25' 30" and Long. 91° 09' 29";
Thence southwesterly to Point P-7, Lat. 33° 25' 25" and Long. 91° 10' 0.0";
Thence southwesterly to Point P-8, Lat. 33° 25' 21" and Long. 91° 10' 28";
Thence [illegible]

Arkansas-Mississippi State Boundary looping Carter's Point, including Luna Bar.

The following is a description, by geodetic positions (M.R.C. datum), of the Arkansas-Mississippi State Boundary looping Carter Point, Miss. west of Tarpley Cut-off Channel, including Luna Bar. This boundary, lying between Latitude 33° 22' 43.5" to 33° 26' 25" and Longitude 91° 06' 39" to 91° 12' 32", begins at the head of Tarpley Cut-off channel and runs westward, southward and eastward along the thalweg and last steamboat navigation course in the abandoned Spanish Moss Bend to the foot of Tarpley Cut-off channel.

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Thence west to Point P-1, Lat. 33° 26' 25" and Long 91° 07' 30";
Thence southwesterly to Point P-2, Lat. 33° 26' 0.0" and Long. 91° 07' 56";
Thence southwesterly to Point P-3, Lat. 33° 25' 47" and Long. 91° 08' 17";
Thence southwesterly to Point P-4, Lat. 33° 25' 40" and Long. 91° 08' 42";
Thence southwesterly to Point P-5, Lat. 33° 25' 36" and Long. 91° 09' 0.0";
Thence southwesterly to Point P-6, Lat. 33° 25' 30" and Long. 91° 09' 29";
Thence southwesterly to Point P-7, Lat. 33° 25' 25" and Long. 91° 10' 0.0";
Thence southwesterly to Point P-8, Lat. 33° 25' 21" and Long. 91° 10' 28";
Thence southwesterly to Point P-9, Lat. 33° 25' 16" and Long. 91° 11' 0.0";
Thence southwesterly to Point P-10, Lat. 33° 25' 10" and Long. 91° 11' 29";
Thence southwesterly to Point P-11, Lat. 33° 25' 06" and Long. 91° 11' 46";
Thence southwesterly to Point P-12, Lat. 33° 25' 00" and Long. 91° 12' 04";
Thence southwesterly to Point P-13, Lat. 33° 24' 52" and Long. 91° 12' 17";
Thence southwesterly to Point P-14, Lat. 33° 24' 46" and Long. 91° 12' 23";
Thence southward to Point P-15, Lat. 33° 24' 37" and Long. 91° 12' 28";

E. A. KNIGHT, REPORTER

P-140

ssissippi River Hydro-
with Appendix III of

APPENDIX B

[Mississippi's Exhibit No. 2 — Mississippi River Hydrographic Survey 1962-1964 Sheet 26 with Appendix III of Mississippi's Exhibit No. 140]

Thence southward to Point P-16, Lat. 33° 24' 23" and Long. 91° 12' 32";
Thence southward to Point P-17, Lat. 33° 24' 11.5" and Long. 91° 12' 30";
Thence southeasterly to Point P-18, Lat. 33° 24' 0.0" and Long. 91° 12' 21";
Thence southeasterly to Point P-19, Lat. 33° 23' 44.5" and Long. 91° 12' 0.0";
Thence southeasterly to Point P-20, Lat. 33° 23' 37" and Long. 91° 11' 49.5";
Thence southeasterly to Point P-21, Lat. 33° 23' 06" and Long. 91° 11' 0.0";
Thence southeasterly to Point P-22, Lat. 33° 23' 0.0" and Long. 91° 10' 48";
Thence southeasterly to Point P-23, Lat. 33° 22' 54" and Long. 91° 10' 34";
Thence southeasterly to Point P-24, Lat. 33° 22' 49" and Long. 91° 10' 18";
Thence eastward to Point P-25, Lat. 33° 22' 48" and Long. 91° 10' 10";
Thence eastward to Point P-26, Lat. 33° 22' 47" and Long. 91° 10' 0.0";
Thence eastward to Point P-27, Lat. 33° 22' 43.5" and Long. 91° 09' 14.5";
Thence eastward to Point P-28, Lat. 33° 22' 44" and Long. 91° 09' 0.0";
Thence northeasterly to Point P-29, Lat. 33° 22' 46.5" and Long. 91° 08' 45";
Thence northeasterly to Point P-30, Lat. 33° 22' 53" and Long. 91° 08' 24";
Thence northeasterly to Point P-31, Lat. 33° 23' 0.0" and Long. 91° 08' 04.5";
Thence northeasterly to Point P-32, Lat. 33° 23' 01.5" and Long. 91° 08' 0.0";
Thence northeasterly to Point P-33, Lat. 33° 23' 09.5" and Long. 91° 07' 40".

Thence southward to Point P-16, Lat. 33° 24' 23" and Long. 91° 12' 32";
Thence southward to Point P-17, Lat. 33° 24' 11.5" and Long. 91° 12' 30";
Thence southeasterly to Point P-18, Lat. 33° 24' 0.0" and Long. 91° 12' 21";
Thence southeasterly to Point P-19, Lat. 33° 23' 44.5" and Long. 91° 12' 0.0";
Thence southeasterly to Point P-20, Lat. 33° 23' 37" and Long. 91° 11' 49.5";
Thence southeasterly to Point P-21, Lat. 33° 23' 06" and Long. 91° 11' 0.0";
Thence southeasterly to Point P-22, Lat. 33° 23' 0.0" and Long. 91° 10' 48";
Thence southeasterly to Point P-23, Lat. 33° 22' 54" and Long. 91° 10' 34";
Thence southeasterly to Point P-24, Lat. 33° 22' 49" and Long. 91° 10' 18";
Thence eastward to Point P-25, Lat. 33° 22' 48" and Long. 91° 10' 10";
Thence eastward to Point P-26, Lat. 33° 22' 47" and Long. 91° 10' 0.0";
Thence eastward to Point P-27, Lat. 33° 22' 43.5" and Long. 91° 09' 14.5";
Thence eastward to Point P-28, Lat. 33° 22' 44" and Long. 91° 09' 0.0";
Thence northeasterly to Point P-29, Lat. 33° 22' 46.5" and Long. 91° 08' 45";
Thence northeasterly to Point P-30, Lat. 33° 22' 53" and Long. 91° 08' 24";
Thence northeasterly to Point P-31, Lat. 33° 23' 0.0" and Long. 91° 08' 04.5";
Thence northeasterly to Point P-32, Lat. 33° 23' 01.5" and Long. 91° 08' 0.0";
Thence northeasterly to Point P-33, Lat. 33° 23' 09.5" and Long. 91° 07' 40";
Thence northeasterly to Point P-34, Lat. 33° 23' 13" and Long. 91° 07' 31" (1956-57 live thalweg);
Thence northeasterly to Point P-35, Lat. 33° 23' 25" and Long. 91° 06' 39" at the foot of Tarpley Cut-off Channel.

APPENDIX C

[Mississippi's Exhibit No. 33 — Mississippi River Commission Chart No. 39]

APPENDIX D

[Mississippi's Exhibit No. 17 — Lloyd's Map of the Lower Mississippi River 1863]

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APPENDIX E

[Mississippi's Exhibit No. 7 — The Western Pilot by Samuel Cumings, 1825]

APPENDIX F

[Mississippi's Exhibit No. 8 — The Western Pilot by Samuel Cumings, 1834]

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APPENDIX G

[Mississippi's Exhibit No. 9 — The Western Pilot by Samuel Cumings, 1841]

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APPENDIX H

[Mississippi's Exhibit No. 10 — The Western Pilot by Samuel Cumings, 1847]

APPENDIX I

[Mississippi's Exhibit No. 11 — James' River Guide, 1856]

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IN THE

Supreme Court Of The United States

NO. 48, ORIGINAL

OCTOBER TERM, 1970

STATE OF MISSISSIPPI ..... *Plaintiff*

vs.

STATE OF ARKANSAS ..... *Defendant*

EXCEPTIONS OF STATE OF ARKANSAS TO REPORT OF HONORABLE CLIFFORD O'SULLIVAN, SPECIAL MASTER

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TREVATHAN PRINTING COMPANY, NEWPORT, ARKANSAS

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EXCEPTIONS OF STATE OF ARKANSAS TO REPORT OF HONORABLE CLIFFORD O'SULLIVAN, SPECIAL MASTER

TO THE CHIEF JUSTICE AND ASSOCIATE JUSTICES OF THE SUPREME COURT OF THE UNITED STATES.

The State of Arkansas respectfully excepts to the Report and Findings filed herein by Honorable Clifford O'Sullivan, Special Master, in the following particulars.

1.

Documentary evidence filed herein completely negates the contentions of the State of Mississippi and the Report of the Honorable Clifford O'Sullivan, Special Master.

2.

The physical facts associated with Luna Bar completely negates the contention of the State of Mississippi and the Report of the Honorable Clifford O'Sullivan, Special Master.

3.

The geology of Luna Bar completely negates the theory of the State of Mississippi, and the Report of the Honorable Clifford O'Sullivan that the Island is the product of a point bar migration.

4.

The Mississippi River Commission's geological investigation, accepted and published by that agency, negates the theory of Dr. Charles Kolb, the theory of the State of Mississippi, and the Report of the Honorable Clifford O'Sullivan, Special Master.

5.

The decisions heretofore entered by the United States District Court, Northern District of Mississippi, and the Chancery Court, Chicot County, are not controlling in this case, and are not a part of this record.

I.

Documentary evidence filed herein completely negates the contentions of the State of Mississippi and the Report of the Honorable Clifford O'Sullivan, Special Master.

There is no controversy between the State of Mississippi and the State of Arkansas that between 1823, the time of the original survey of Arkansas in Spanish Moss Bend (Exhibit D-1, also compiled in Exhibit P-1) and 1872, the Island formation is not shown on any map.

Dr. Charles Kolb, in behalf of the State of Mississippi, agreed that in 1841, Exhibit P-9 (TR. 321), no island formation is shown; that in 1864-65, Exhibit P-19 (TR. 323-324) no island formation is shown, but is shown in 1872, Exhibit P-100. (TR. 324)

Mr. Austin Smith, in behalf of the State of Mississippi, also concluded that in 1850 (Exhibit P-13) no island formation is shown in Spanish Moss Bend (TR. 401-402), nor is there an island formation in 1859, Exhibit P-16 (TR. 402-403), there is no divided flow of the river in Spanish Moss Bend from 1863 through 1865. (TR. 417)

Dr. Clarence Durham, in behalf of the State of Arkansas, also concluded from the same exhibits referred to above by Dr. Kolb and Mr. Austin Smith, and in addition thereto, defendant's Exhibits D-6, D-7, D-8 and D-9, all purporting to show Spanish Moss Bend in the year 1871, do not show a divided stream or an island formation in Spanish Moss Bend. Defendant's Exhibit D-8, Map of Washington County, Mississippi, in 1871 does not show either a land mass forming onto Carter Point, Mississippi in Spanish Moss Bend, nor an island, nor a divided channel, with the river in its original position.

Defendant's Exhibit D-9, an 1871 Sectional Map of the State of Arkansas, shows the sections of land in Chicot County, adjacent to Carter Point, Mississippi, to have the same size and shape as in the original Government Land Office Survey of 1823, without a divided channel or an island formation.

Dr. Kolb, Mr. Austin Smith, Dr. Clarence Durham and Mr. Spillers all conclude that the first indication of an island formation in Spanish Moss Bend appears in 1872, with Defendant's Exhibit D-11, also Plaintiff's Exhibit P-100.

Both the State of Mississippi and the State of Arkansas, by Mr. Austin Smith in behalf of the State of Mississippi (TR. 423-424) and Dr. Durham, in behalf of the State of Arkansas, conclude that the map of 1872 (Exhibit D-11, P-100) was prepared for the purpose of new levee construction, and show the levees that have been washed away.

Not only does the map of 1872, Defendant's Exhibit D-11, Plaintiff's Exhibit P-100, show the evidence of a large flood action, but also that within a one year period, between 1871 and 1872, the island appears and there is a divided river.

Major Suter in 1874, Defendant's Exhibit D-12, Plaintiff's Exhibit P-29, clearly shows in Spanish Moss Bend, an island formation, with a divided channel, with the eastern channel, east of the island, marked Spanish Moss Bend, and shows that the navigation channel is in the western channel, west of the island. Major Suter mapped the entire Mississippi River and in doing so, Spanish Moss Bend is the only place when the name of the bend of the river was placed on the bar side of the river rather than

the bendway side of the river, even when squeezed for space to write in.

The recorded evidence of all maps herein do not support the contention of the State of Mississippi that the island formed as ordinary Point Bar Accretions to Carter Point, by the slow process of erosion and accretion. These maps reject such theory in its entirety.

These maps do support the position of the State of Arkansas that Luna Bar is the product of an avulsion, occurring in the year 1872, whereby a portion of the Arkansas mainland was isolated creating an island now called Luna Bar.

II.

The physical facts associated with Luna Bar completely negates the contention of the State of Mississippi and the Report of the Honorable Clifford O'Sullivan, Special Master.

The State of Mississippi bases its claim to Luna Bar upon the theory of a point bar migration, which is given by Dr. Charles Kolb and Mr. Austin Smith. Neither Dr. Kolb nor Mr. Smith gave any testimony as to the geology, conditions, or factual evidence on Luna Bar itself, but both gave theories by which it was possible to account for the existence of the island.

As set forth in *Ussery v. Anderson-Tully Company*, 122 F. Supp. 115, 211, Judge Young stated:

> ". . . . if the theory of one expert in controversy is correct, it will find corroboration on the ground . . . . . on the other hand, a theory which is not supported by physical evidence is subject to grave doubt. . . ."

Dr. Charles Kolb did not, as heretofore set forth, detail any physical evidence from the island itself. Dr. Kolb used many abstract slides to show actions of the River generally, or as he stated, related to river morphology. Not one single bit of physical evidence on the island itself was produced by Dr. Kolb.

Dr. Kolb did prepare slides from tracings that he made from charts on file with the Mississippi River Commission, showing thereon a reference line surveyed by Mr. Guyer. From these slides and the reference lines thereon, Dr. Kolb gave certain conclusions based upon his opinion.

Dr. Kolb's profile cross-sections on Exhibits P-90 through P-93 were prepared using the reference line of Walter Guyer, across the northern portion of the island, which is not the highest part of the island and completely bypasses the central part of the island, which is the highest elevation.

Dr. Kolb also reduced the recorded elevations on the island by seven feet (TR. 325) to convert from Memphis Datum to Mean Gulf Sea Level. However, Dr. Kolb did not reduce the recorded elevations on either the Arkansas Mainland or Carter Point, Mississippi, this corresponding seven foot reduction thereby creating a vast difference in recorded elevation of the island as compared to the river bank on the Arkansas and Mississippi Mainlands.

By overlaying the maps prepared by Dr. Kolb from tracings by Dr. Kolb of Mississippi River Charts, Exhibits P-90 through P-93, the central core of Luna Bar is contained on all four maps, the central core mass of Luna Bar is represented as land on all four maps, (TR. 1002-3), Defendant's Exhibit D-81, drawn from Dr. Kolb's overlays depicting land that is common on all overlays, showing the

central high mass of the island never eroded away and has been in the same place throughout. (TR. 1004) Defendant's Exhibit D-64 shows that this island core has recorded elevations of 133.4, 133.1, 133.5, 133.5 and 133.2, five elevations that exceed 130 feet, and on the Arkansas bank, immediately adjacent to the high part of the island, the elevations are 132.2, 139.1, 136.1, 134.8, 139.0, 138.7 and 136.7; therefore, the difference in elevation of the high part of the island and the Arkansas bank is less than four feet in elevation, while Carter Point, Mississippi is two and one-half foot higher than the average Arkansas bankline. (TR. 1006) Thus, when Dr. Kolb attributed the elevation of the island at 113 MSL, he was referring to the elevation at the reference line of Mr. Guyer, not at the highest elevation. Further, he reduced the elevation on the island by seven feet, but did not make a corresponding reduction of elevation on the Arkansas bank.

Thus, the physical evidence shows clearly that the island is basically equal to the elevations of the Arkansas mainland, and is not the low-lying mass that a point bar would have been.

Richard Proctor, born November 6, 1882, who had spent a lifetime in the area of the island, said:

"Q. Did it ever wash away the bar — the island out there?

A. Well, up on the end of the bar next to Island 82, when the levee broke at Bentley Quarters it washed all the way down from the Hole in the Wall down to this house — er — kinda angling like — hit run up through there past Pastoria on up. (TR. 1095)

Q. Did it ever wash away the whole island?

A. No, sir.

Q. When you were a young man what was this island called?

A. They just called it Pastoria Bar — time that I speak about. . .

Q. What was it a part of?

A. Pastoria. (TR. 1096)

Q. Have you ever heard of Luna Bar?

A. That is what they called that Pastoria. (TR. 1097)

Q. Did the river ever cave off all of Pastoria?

A. Oh, no, sir!

Q. What was left in there?

A. There was a Point left in there on that Bar at the South end down this way. Coming from what we call the Hole in the Wall. That Hole in the Wall was the cause of that Bar caving all around up there — just this side before you get off of Linwood — let me see — on the bar — I remember an old Cistern — I don't know what became of that old Cistern — I hunted pretty well all the time round there — I remembers going and looking in that old Cistern. I found a (Mink) in that Cistern — and I cut a pole and got him out — and when I went out again I don't know what became of that cistern.

Q. This place you called a point or an island, did it ever wash away in your lifetime?

A. On this end of that island down next to Luna —

just like you go out to Pastoria Landing — that's as near as I can remember." (TR. 1098)

From the testimony of Mr. Proctor, who was living in that place from birth in 1882, there is living testimony that the island called Luna Bar was a part of Pastoria, created by the water washing through the "Hole in the Wall" on the north side. Further, from his testimony, at one time there was a cistern on the island out of which Mr. Proctor took a mink. The fact that a cistern was on the island completely rebuts the point bar migration theory.

Located on top of the island, Mr. John Putnam, an eminent forester, whose qualifications were admitted and recognized by the State of Mississippi as an expert in the field of forestry, was a red mulberry, which Mr. Putnam stated:

"Q. Did you determine whether that tree grew there or was placed there accidentally some way?

A. It unquestionably grew there." (TR. 565)

Mr. John Thompson, Chief Forester for Johns-Manville Products Corporation, stated:

"Q. Did you examine that tree at the time or that stump?

A. Yes.

Q. Was it a tree that grew there or was it cast there by some phenomenon?

A. It grew there." (TR. 647)

This relic tree was 84 years old from ring count. From the legends on the available maps from 1880 forward, there is no evidence of any tree of that age; therefore, this tree had its life at least 84 years prior to 1880, or at the very

earliest, in 1796, long before the Government Land Office Survey of 1823, and long before the island appeared as an island in 1872.

Also located on this island was a second tree stump, also located on the higher elevation of the island. Mr. Thompson stated:

"Q. Where was its location?

A. The first one was here and the second one was right up here.

Q. Up on the high ground?

A. Yes, sir.

Q. Did you check the stump to see if it was growing in place or was it just laying on the island?

A. It was growing in place. I dug around it enough to see that its roots went well down in the soil.

Q. Were you able to determine as a forester whether it grew there or came there by some other possibility?

A. It grew there definitely." (TR. 653)

This tree was 110 years old when it died. (TR. 654)

A third tree, a black walnut, was found by Mr. Thompson:

"Q. Were you able to determine what kind of tree it was?

A. Yes, sir, that was a black walnut." (TR. 655)

This tree was 55 years old when it died. Mr. Thompson studied maps available in the Mississippi River Commission, all exhibits herein, and the notes on the 1879-80 survey, and neither the maps or notes did not indicate any

trees represented by the three stumps. The Aerial Photographs (D-31) conclusively show that the trees represented by these stumps could not have lived and died between 1880 and 1930, nor at any time between 1930 and the current date. (TR. 657)

Mr. Thompson located cypress stumps in the west channel on the west side of the island (Exhibit D-52) which dated 200 years plus. This Exhibit, D-52, was from a group of stumps that grew there, evidenced by their position and the "knees" growing around the stumps, all of which were in place. (TR. 663)

From the foregoing, the physical evidence completely rebuts the theory of Dr. Kolb and Mr. Smith that Luna Bar had its origin as an extension of Carter Point by reason of point bar migration. The testimony of these expert witnesses, standing alone, would raise a presumption that their theory was a possible explanation for the existence of the island. If their theory was correct, it would be substantiated on the ground, by the absence of proof to the contrary. However, this theory is conclusively shown to be incorrect, and like all presumptions, when proof to the contrary is shown, the presumption fails. Trees that date 200 years or more in the past, could not have been there had the island originated as a point bar. Richard Proctor could not have captured a mink in a cistern on the island, had the island been the product of a point bar. The evidence conclusively shows that the river did not by imperceptible slow process of erosion and accretion creeping across the intervening space occupied by Luna Bar, erasing the land and restoring same by accretions to Carter Point, thereafter cutting across the accretions to form a divided channel and leaving this accretion product as an island then isolated from Carter Point.

III.

The geology of Luna Bar completely negates the theory of the State of Mississippi, and the Report of the Honorable Clifford O'Sullivan that the Island is the product of a point bar migration.

To sustain the theory of the State of Mississippi, Mr. Austin Smith theorized that the flow of the Mississippi River was hard against the Arkansas bank, and, therefore, much caving was taking place, with a contemporaneous accretion to Carter Point, on the Mississippi side.

When the United States Corps of Engineers made its historical study of this reach of the River, the Engineers prepared and filed with the Mississippi River Commission a map, Exhibit D-32, showing the bank line of the river from 1882 through 1930. This map shows the area in question, Spanish Moss Bend with the island, virtually stable from 1882 through 1930, with the two channels of the river on each side. There is no appreciable caving of the bank on the western side of the island, nor any accretions to Carter Point, Mississippi. The navigable channel in the western side of the island was hard against the Arkansas bank, west of the cypress stumps that are found on the west side of the island.

Mr. Austin Smith, reading from Report to Congress in June, 1866, read from Exhibit P-134:

> "In the Bend above Columbia, the bank is caving badly. There are two breaks at Bellview and Pastoria." (TR. 419)
>
> "Besides the local importance of these breaks, the crevassed water through them floods the land be-

low the Tensas. Part of the floods through the breaks above Columbia passes into the bed and does not reach the Tensas bottoms." (TR. 420)

It is respectfully noted that General Humphrey mentioned Pastoria by name, and referred to a badly caving bank above Columbia. General Humphrey did not report a badly caving bank at Pastoria, or in Spanish Moss Bend, but used the words "in the bend above Columbia".

Mr. Austin Smith used these words to substantiate his theory of a caving bank, by stating, "the bend above Columbia is Spanish Moss Bend". This is, of course, a possibility, which if supported, could be accepted.

The U.S. Corps of Engineers outlined the caving of the bank as occurring above Columbia, between Luna and Columbia, and not in Spanish Moss Bend. General Humphrey also noted that the floods through the breaks in the levee above Columbia "passed into the bed and does not reach the Tensas bottom". The only way the flood could return to the "bed" of the river was for the flood water to return through a low lying area, such as an ancient abandoned channel.

Dr. Clarence O. Durham, admitted to be qualified by the State of Mississippi, head of the Geo-Science Department at Louisiana State University, being informed of the contention of the two States, investigated the island on the "Multiple Hypothesis" basis, wherein he sought evidence to confirm, or refute, one of the theories. He spent two days on the island itself, in addition to studying all maps introduced, commencing in 1765. Dr. Durham also noted that all available maps from 1823 through 1871 did not show a divided channel, or the existence of an island in Spanish Moss Bend. By comparing Exhibit D-9 with the

original survey of 1823, the sections shown on Exhibit D-9 were apparently identical with Exhibit D-1, also P-4. Exhibit D-8, ownership map of Washington County, Mississippi, dated 1871, does not show an island formation off Carter Point, Mississippi, nor accretions attached thereto, *nor a divided channel.* In 1872, Defendant's Exhibit D-11, also Plaintiff's Exhibit P-100, shows an abrupt shift of the Arkansas western bank, in a one year period, levees breached. Dr. Durham concluded, just as Mr. Austin Smith concluded, that the purpose of Exhibit D-11, was to plan new levee construction, which is shown completed on Exhibit D-13, and is west of swale, identified an abandoned prehistoric channel of the river. Dr. Durham further found evidence of this ancient channel by checking elevations when investigating the western channel, or the channel between the Arkansas mainland and the island of Luna Bar. From the position of the cypress stumps on the Arkansas mainland and the cypress stumps on the west side of Luna Island, he found physical evidence on the ground to verify that a prehistoric river channel did in fact exist west of the island.

Dr. Durham concluded that Luna Bar was at one time, pre-historically, an island with an abandoned river channel lying west of Luna Bar, evidenced by the physical lay of the land and cypress stumps which represent an old clay plug that represents an abandoned channel, that existed prior to the Government Land Office Survey. Dr. Durham concluded that prior to the Government Land Office Survey, Exhibit D-1, the river had occupied the channel west of the island, but in 1823, when Exhibit D-1 was surveyed, this channel had been abandoned and the river occupied the channel east of the island, as shown in 1823 by Exhibit D-1.

"The Master: Then to use a crude expression, your position is that the river has been see-sawing back and forth in that area?

A. Exactly.

Q. Did the see-sawing take place prior to 1823?

A. All of the see-sawing except the last event, which happened in the Seventies, had occurred before the land surveys.

Q. Of 1823?

A. Of 1823."

Dr. Durham also noted the position of the levees breached on Exhibit D-11, were in the position that they were to be west of the abandoned channel on the west side of the island into which the river avulsed, because levees are positioned to be behind the next swale or abandoned channel.

Dr. Fisk, in Exhibit D-30, reached the same conclusion reached by Dr. Durham, that the river avulsed around the island, not by erasing. This is clearly shown on Exhibit D-30 by the legend 10, in the center of Luna Bar.

Dr. Kolb agrees with Dr. Fisk that the clay plug shown by Dr. Fisk, and its alignment on the Arkansas bank west of the island, but apparently contended that this ancient abandoned channel stopped with the Arkansas west bank and did not extend further east. Dr. Kolb did not explain why this ancient course number 10 would stop at that point abruptly and not extend further onto the island itself as found by Dr. Fisk and Dr. Durham. Dr. Durham, (at TR. 1010) was not in complete agreement with Dr. Fisk's orientation of channel 10 as shown by Ex-

hibit D-30, Dr. Durham finding that Dr. Fisk's course 10 was at a higher angle to the relic cypress stumps that he found in the western channel, and oriented to the north of the cypress stumps representing the abandoned channel rather than in a northwest-southeast direction making the abandoned channel run counter to the positioning of Dr. Fisk. Whether Dr. Fisk's orientation of the abandoned channel is correct, or that of Dr. Durham is really moot, since both conclude that the center of the island is the hard base of an ancient clay plug that dates many years prior to 1823 and is still in place today.

The escarpment on the eastern side of the island's central core coincides with the shore line of Arkansas in 1823. By overlaying Exhibit D-1A, plastic overlay of Exhibit D-1, Original Government Survey, with any exhibit, and particularly aerial photographs, Exhibits D-65 and D-66, the eastern escarpment is remarkably intact and coincides with the original survey of 1823.

Dr. Durham further noted that the survey of Mr. Burkhart, Exhibit P-130 A, shows the section lines 500 feet further east than the section lines actually are (TR. 1013-1015), therefore, the overlays of Dr. Kolb, Exhibits P-90 through P-93, actually eliminate 500 feet of the island that actually existed.

Mr. Spillers made numerous borings on the highest land mass of the island itself and could not find any swales or clay plug materials associated with a point bar. There were no materials found in that area compatible with point bar formation. (TR. 846)

Mr. Spillers' borings also substantiated that the alignment of the ancient channel referred to by Dr. Durham was southeast, and was clearly evidenced even today with

the cypress stumps alignment. Mr. Spillers also found that the cypress stumps lay east of the thalweg of the western channel.

The breached levees to the west of the island, allowing the river in its direct approach to the breached levees north of the island, over the years to scour out the land, then adopt the existing abandoned channel and around the island leaving it isolated. Mr. Austin Smith, quoting from General Humphrey's report of 1866, states that the levees were breached in 1866, and we know that the levee at that point was breached through 1872. It is common knowledge that with each spring rise on the river, the waters will flood through the breach. The Mississippi River is, at the north side of the island, flowing due west, and in flood stage would continue flowing due west rather than make the ninety degree turn to head south.

Since the soil structure on the island is incompatible with point bar accretion, the only conclusion is that the island is not part of that origin. How the river would isolate this land mass is clearly shown by Dr. Durham and Mr. Spillers, substantiated by the ancient trees, represented by stumps found on the high island area, aged without regard to carbon dating at 80 to 100 years old prior to 1880, well before 1823, the time of the Original Survey, and substantiated by "Part of the floods through the breaks above Columbia passes into the bed and does not reach the Tensas Bottom." The only breaks reported above Columbia is at Pastoria, and in 1866, General Humphrey reported part of the flooding passing into the bed. The only way a part of the flood could pass to the bed is exactly as concluded by Mr. Spillers and Dr. Durham.

The physical facts simply rebut the presumption and theory of Dr. Kolb and Mr. Smith.

IV.

The Mississippi River Commission's geological investigation, accepted and published by that Agency, negates the theory of Dr. Charles Kolb, the theory of the State of Mississippi, and the Report of the Honorable Clifford O'Sullivan, Special Master.

The position of the State of Mississippi is that the land mass known as Luna Bar formed as ordinary Point Bar Accretions to Carter Point, Washington County, Mississippi. (TR. 34) Even though Luna Bar occupies the geographical area of land originally in the State of Arkansas, the State of Mississippi contends that by the slow process of erosion and accretion creeping across the intervening space between the location of the navigable channel in 1823 and its location in 1880, erased the land area now occupied by Luna Bar, replacing same with accretions that now constitute Luna Bar.

To support its theory, the State of Mississippi called Dr. Charles Kolb, Chief of the Geology Branch of the Waterways Experiment Station.

Dr. Kolb, when commencing his lecture on the morphology of a river used many slides, to depict the expected actions of the river.

> "The Master: This is an abstract drawing, it is not fitted into Luna Bar?
>
> A. Not at all, no, sir. In fact most of the slides that I will show you now are slides that I use in a class which I teach at the Waterways Experiment Station in Engineering Geology when I start talking about rivers to my students." (TR. 267)

Dr. Kolb admitted that the slides he used did not concern Luna Bar, but were used to illustrate some features that he felt applied to Luna Bar. (TR. 283) Dr. Kolb gave great weight to the comprehensive study made by Dr. H. N. Fisk for the Mississippi River Commission. (TR. 300)

> "Coming back to the way Fisk and his colleagues began work on this, they came up with a series of maps, and this is Exhibit P-98, and Plates 8 and 9 of Fisk's geological investigation . . . . . What Fisk and his group have done was to try to date the position of the Mississippi River in 100 year increments, going back 15 or more centuries . . . . . You have to overlay these channels of the river one on top of the other and, of course, this makes for a very difficult method of portraying this. (TR. 302) The only river you can show in its entirety is the river that was current at the time, the 1939 river shown in white here. The river shown there for the previous century is shown in green, that is the 19th century, and whenever it crosses that white, of course it is cut out, it can't be shown because it went under that river, and so on. The previous one was cut out by the 19th and 20th century ones. So by the time you get back ten centuries in this dating, you can show very selective segments of the river, because the other areas are preempted by all these colors . . . . . Everyone of these colors once was the river. . . . .
>
> "Q. Doctor, for the record, does that bear a number 10, which (TR. 303) would indicate the 10th century?
>
> A. Yes, it does.
>
> Q. What is the color of that?
>
> A. It is red with a light red stripe and a heavy red

stripe . . . . . Fisk believed that particular plug was formed in the 10th century.

The Master: You mean sometime about the Tenth Century, the river changed its course there?

A. Yes, sir, and cut itself off. (TR. 304)

Q. Dr. Kolb, what effect did this clay plug or other clay plugs have on retarding the caving of the river bank where the clay plug was in existence as against caving of river bank where you were dealing with old Point Bar formations?

A. The clay plug very definitely retarded the growth of a bend. . . .

Q. Would that have a retarding effect on the ability of the river to jump over bank, as contended by Mr. Spillers, and course back into this clay plug area?

A. No, it wouldn't.

Q. Not on that?

A. No.

Q. His mapping this Number 10 course and shows this clay material, does that help you in dating the age of the soil?

A. Yes, it does. If we take Fisk at face value, (TR. 311A) it would suggest that the soil that fills this particular plug was laid there sometime in the 10th Century.

Q. Moving over to Luna Bar, is there any indication in Luna Bar at this location of a similar soil formation of ancient origin?

A. No, sir. (TR. 312)

Q. Are there any points to be made?

A. The point I would like to make because this is appropos to the next two exhibits that I show, which are also geological maps, the point I would like to make is the very one that you mentioned, Mr. Ward, and that is this: That if an outside avulsion occurred in this area, it would have isolated a part of the Arkansas Bank, which would have included this clay plug."

The State of Arkansas contends that Luna Bar is not the product of a point bar migration, but is in fact, an isolated part of the Arkansas Bank, just as surmised by Dr. Kolb. An examination of Plaintiff's Exhibit No. 98, also Defendant's Exhibit No. 30, readily shows that Luna Bar contains the coloring alluded to above by Dr. Kolb, contains the legend 10 ancient course, and conforms identically to the high area of Luna Bar, from which the red mulberry found by John Putnam, recognized by the State of Mississippi as an expert in the field of forestry, by visable ring count 84 years exclusive of sap rot (TR. 566) and aged by Dr. Iddings to be 555 years, plus or minus 180 years. Also in this area was found a walnut, flagged and left in place by Mr. John Thompson, Forester, (TR. 653) aged 110 years old at time of its death. (TR. 654)

Dr. Fisk, in 1944, in behalf of the Mississippi River Commission, clearly shows on Exhibit No. P-98, also Defendant's Exhibit No. 30, that the high land mass of Luna Bar dates back to the 10th Century. The physical evidence found by Mr. Putnam and Mr. Thompson completely and absolutely confirms the geological investigation of Dr. Fisk. Further, there appears stumps east of the

western channel of the river that could not exist had the river migrated across the land area known as Luna Bar.

Had the origin of Luna Bar have been an ordinary point bar forming as an accretion to Carter Point, the physical evidence evidenced by these trees, cypress stumps east of the western channel of the river, could not have existed. They would have been erased by the migration of the river. While the State of Mississippi states that these tree relics could have washed in by flood waters, this indeed may have been an imaginary possibility.

The Master's Report states that the contention of the State of Mississippi in that these stumps washed in was sustained by prior courts is erroneous. The evidence of the relic trees found on top of the island were not discovered at that time, and this record is the only record of their existence. This red mulberry and walnut were discovered by foresters, both qualified in their field, and both agreed that the trees represented by the stumps grew there and did not originate anywhere else.

Dr. Fisk's geological survey, Exhibit D-30, also Plaintiff's Exhibit No. P-98, accepted and published by the Mississippi River Commission, clearly showing the central core of the island to date back to the 10th Century, plus the relic trees, clearly date the age of the central part of the island back beyond 1823.

These facts clearly negate the theory of the State of Mississippi and the inferences and presumptions created by Dr. Kolb and Mr. Smith.

The land mass is an isolated portion of the State of Arkansas, created by the action of the river passing around a portion of the Arkansas mainland, and not the product of a point bar accretion.

V.

The decisions heretofore entered by the United States District Court, Northern District of Mississippi, and the Chancery Court, Chicot County, are not controlling in this case, and are not a part of this record.

Prior litigation between private parties cannot resolve boundary lines between States or impair the sovereign rights of the respective States. The Court, in *Durfee v. Duke*, 375 U.S. 106, 115 (1963), said,

> "It is to be emphasized that all that was ultimately determined in the Nebraska litigation was title to the land in question as between the parties to the litigation there. Nothing there decided, and nothing that could be decided in litigation between the same parties or their privies in Missouri, could bind either Missouri or Nebraska with respect to any controversy they might have, now or in the future, as to the location of the boundary between them, or as to their respective sovereignty over the land in question. *Fowler v. Lindsey*, 3 DALL 411; *New York v. Connecticut*, 4 DALL 1; *Land v. Dollar*, 330 U.S. 731, 736-737. Either state may at any time protect its interest by initiating independent judicial proceedings here. CF *Missouri v. Nebraska*, 196 U.S. 23."

No prior court has had before it the evidence before this Court in behalf of the State of Arkansas.

The foresters who are familiar with the formation of lands by accretion have accepted the fact that the type trees found on a given area will determine the age of the soil on which the trees grow. Both the State of Arkansas and the State of Mississippi recognize this fact. All fores-

ters herein are in agreement that trees grow on newly formed alluvial lands in a definite and predictable pattern. First appear the primary species, cottonwood and willow, which cannot re-seed themselves in their shade, but must have sunlight. This primary forest exists alone, with isolated individual trees therein as exceptions for 30 to 40 years, (TR. 145) (TR. 560) at which time the Secondary species appear, as the secondary species is more tolerant to shade; however, this secondary species does not become dominant for 50 to 60 years thereafter. (TR. 145) (TR. 560) The secondary species are trees such as sycamore, sweet pecan, box elder, ash, etc., are followed by the climax series of trees, such as sweet gum, water oak, bitter pecan, red bud, winged elm, decidious holly, hawthorne, sassafras, swamp dogweed, etc. (TR. 635)

There is no conflict in any foresters testimony that lands where climax trees appear in abundance, not as isolated trees, the land mass on which they grow is at least 150 years old.

There is actually no conflict in the testimony of the foresters. Mr. Guyer, in behalf of the State of Mississippi, limited his statements to the "predominate forest" on the island as a whole. Since all the island except its higher areas is the production of accretion to the high area, his statement would be true to the island as a whole, but totally incorrect insofar as the high land is concerned.

Mr. McKnight did not go upon the high area of the island, but only went on the south end of Luna Bar and the eastern side, but did not go on the high area, the north or west side. (TR. 148) Mr. McKnight simply did not go to the oldest area of the island, the higher plateau area, therefore, he would not have seen the climax series of trees.

On the top of the island, all of the climax species are found. (TR. 635) In addition to the climax series, there are numerous introduced species of trees, trees that are not native. Mr. John Putnam believed them to be planted there during some period of habitation, since their arrangement would not likely happen otherwise.

The age of a particular tree, or for that matter the trees available, is not the criteria for determining the age of the land on which the trees grow. It is the type or class of trees, the biological forest. The mere presence of stands of climax trees ages the land at more than 150 years.

From the tree growth on top of Luna Bar, or Luna Island, or Pastoria Bar, whatever it is called, the physical facts exists that the forest on top of this land mass is of the climax series, which standing alone would negate the presumptions raised by the testimony of Mr. Austin Smith and Dr. Kolb.

CONCLUSION

Given its highest probative value, the entire case of the State of Mississippi is based upon theoretical presumptions, without one shred of physical evidence to verify the presumptions. The theories of Dr. Kalb and Mr. Austin Smith do not find any corroboration on the ground.

Verifying the theory of Dr. Clarence Durham is the physical evidence of the pre-existing west channel; the climax forest on the top of the island; ancient trees found in place aged well over 200 years by map observations and actual ring count; aged at well over 300 years by carbon dating at time of their death; evidence of a cistern on top of the island within the lifetime of Mr. Proctor and by Mr. Proctor stated to be a part of Pastoria cut off by the action of the river; maps on record to the year 1871 completely rebutting the theory of a caved bank; Geological study published by the Mississippi River Commission completely and unequivocally supporting the State of Arkansas that Luna Bar is an ancient, isolated portion of Arkansas; the borings made by Mr. Spillers negating the theory of point bar migration; recorded flood waters particularly in 1872; the positioning of Spanish Moss Bend by Major Suter in 1874; the official County Map of Chicot County dated 1828 by W. A. Mahla, clearly showing the island in the State of Arkansas; tax records; evidence of trees that grew east of the Western thalweg of Luna Bar over 200 years old by ring count, all collectively or individually negate the presumption raised by the theory of the State of Mississippi.

In *Commissioners v. United States*, 270 F. 110, 113 (8th Cir. 1920), the Court considered the effect of a shifting of the thalweg of the Arkansas River around an island from South to North, and concluded:

"The general rule on this subject is: (1) that where the thread of the main channel of the river is the boundary between two states and it changes by the flow and natural processes of accretion and reliction, the boundary follows the channel; (2) but, where it changes by the sudden and violent process of avulsion, the boundary remains where the main channel was at the time of the avulsion, subject always to such changes as may be wrought after the avulsion by accretion or erosion while the old channel is occupied by a running stream. Counsel rely upon the first clause of this rule. That clause is applicable to and governs cases where the boundary line, the thread of the stream, by the slow and gradual process of erosion and accretion creeps across the intervening space between its old and its new location. To this rule, however, there is a well established and rational exception. It is that, where a river changes its main channel, not by excavating, passing over, and then filling the intervening place between its old and its new main channel, but by flowing around this intervening land, which never becomes in the meantime its main channel, and the change from the old to the new main channel is wrought during many years by the gradual or occasional increase from year to year of the proportion of the waters of the river passing over the course which eventually becomes the new main channel, and the decrease from year to year of the proportion of its waters passing through the old main channel until the greater part of its waters flow through the new main channel, the boundary line between the states remains

the old channel subject to such changes in that channel as are wrought by erosion or accretion while the water in it remains a running stream." (Citations omitted)

"In Davis v. Anderson-Tully Co., 252 F. 681, 685 (8th Cir. 1918), the Court applied the same rule announced in Commissioners v. United States, supra, to a boundary dispute involving the state line between Arkansas and Mississippi.

"(1) The authorities therefore appear to be uniform in holding that the State line, located in the thalweg, or the middle of the main channel of navigation of a navigable river only moves with those changes in the thalweg which occur when the river through natural processes, excavates, passes over, and then fills the intervening space between its old and its new main channel; i.e., changes made by the slow and natural processes of accretion."

The same ruling is found in *Kansas v. Missouri*, 322 U.S. 229, 64 S. C. 983, 88 L. Ed. 1244 (1944).

There is but one conclusion that can be reached herein, that Luna Bar is an isolated part of the State of Arkansas, isolated in 1872 by the avulsive action of the Mississippi River changing its main channel by flowing around the intervening land which never became its main channel.

Luna Bar is in the State of Arkansas and the boundary between the State of Arkansas and the State of Mississippi

is in the same channel that has always existed lying east of Luna Island, between the Island and Carter Point, Mississippi.

Respectfully submitted,

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REPLY

BRIEF

SUPREME COURT, U. S.

JUN 16

MICHAEL RODAK, J.

IN THE

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1970

No. 48 Original

STATE OF MISSISSIPPI,
Plaintiff,

vs.

STATE OF ARKANSAS,
Defendant.

RESPONSE OF THE STATE OF MISSISSIPPI TO THE EXCEPTIONS OF THE STATE OF ARKANSAS TO THE REPORT AND RECOMMENDATIONS OF THE SPECIAL MASTER

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RESPONSE OF THE STATE OF MISSISSIPPI TO THE EXCEPTIONS OF THE STATE OF ARKANSAS TO THE REPORT AND RECOMMENDATIONS OF THE SPECIAL MASTER

The State of Mississippi confesses some difficulty in responding to the exceptions filed on behalf of the State of Arkansas due to the fact that Arkansas largely restates its position as argued before the Master, refers to its testimony as presented to the Master, and then argues that the Master should have decided the case in Arkansas' favor. There is an almost total lack of any reference to the overwhelming testimony submitted by the State of Mississippi in support of her position. The Special Master, in his Report, discussed the conflicting testimony at length and gave reasons why he accepted as correct the testimony of the Mississippi witnesses and rejected the testimony of the Arkansas witnesses. Although it will unduly lengthen our response, we know of no way to meet this type of argument

other than to comment to some degree on the testimony submitted by Mississippi and to make reference to the applicable court decisions to show that, in the opinion of Mississippi, the Report of the Master is not only correct, but that any other finding by the Master would be unsupported by credible evidence.

I

IF THE REPORT OF THE SPECIAL MASTER IS SUPPORTED BY SUBSTANTIAL EVIDENCE AND IS NOT CLEARLY ERRONEOUS, IT SHOULD BE APPROVED, CONFIRMED AND ADOPTED BY THIS COURT

Rule 9(2) of the Supreme Court rules provides as follows:

> "2. The form of pleadings and motions in original actions shall be governed, so far as may be, by the Federal Rules of Civil Procedure, and in other respects those rules, where their application is appropriate, may be taken as a guide to procedure in original actions in this court."

Rule 53 of the Federal Civil Rules deals with Masters and under sub-section (c)—Powers, states:

> "The order of reference to the Master may specify or limit his powers and may direct him to report only upon particular issues or to do or perform particular acts or to receive and report evidence only and may fix the time and place for beginning and closing the hearings and for the filing of the Master's report. . ."

Reference to the record will show that the Special Master has followed the provisions of Rule 53 meticulously.

Rule 53(e) (2) states:

> "In non-jury actions. In an action to be tried without a jury the court shall accept the Master's finding of fact unless clearly erroneous . . . The court after hearing may adopt the report or may modify it or may reject it in whole or in part or may receive further evidence or may recommit it with instructions."

The only case that we have found dealing with the applicability of the Federal Civil Rules to original proceedings under Rule 9, appears in the case of *State of Utah* v. *United States,* 398 U.S. 89, 95, 22 L.Ed.2d 99, 105, 89 S.Ct. 761 (1969) wherein the court stated:

> "[S]ince the Federal Rules are a guide to the conduct of original actions in this court only 'where their application is appropriate,' Rule 9(2) of the rules of court, and since our original jurisdiction should be invoked sparingly, we hold that the State of Utah may properly waive the protection of Rule 19 here."

In *Utah* the court was dealing specifically with the claim of Morton International, Inc. that it was entitled under Rule 19(a) to intervene.

While the quoted portion of the opinion simply restates the rule itself, it certainly seems to say that "where appropriate" this court will follow the Civil Rules of Procedure and this would seem to apply to the disposal of the exceptions to the Master's Report. Even in the absence of formal rules, this court has always taken the position that it had the inherent authority to prescribe its own mode and form of proceedings in cases of original jurisdiction. *Florida* v. *Georgia,* 17 How. 478, 15 L.Ed. 181 (1855).

Prior to the adoption of the Federal Rules, this Court had on numerous occasions considered the weight to

be given findings of fact by a Special Master in chancery cases and under the old equity rules. Illustrative is the case of *Metsker* v. *Bonebrake*, 108 U.S. 66, 27 L.Ed. 654, 655 (1855), which stated the rule to be:

> "The findings of the Master are *prima facie* correct. Only such matters of law and of fact as are brought before the court by exceptions are to be considered and the burden of sustaining the exceptions is on the objecting party."

The case of *Sheffield & Birmingham Coal, Iron & R. Co.* v. *Gordon*, 181 U.S. 285, 290, 38 L.Ed. 164, 165 (1893), again dealing with a Master's report in equity, laid down these requirements as to the form that the exceptions to the report should take:

> "Proper practice in equity requires that exceptions to the report of a master should point out specifically the errors upon which the party relies, not only that the opposite party may be apprised of what he has to meet, but that the master may know in what particular his report is objectionable, and may have an opportunity of correcting his errors or reconsidering his opinions. The court, too, ought not to be obliged to rehear the whole case upon the evidence, as the main object of a reference to a master is to lighten its labors in this particular. In the case of Dexter v. Arnold, 2 Sumn. 108, an exception to a report of a master that he had stated and certified that there was due on a certain mortgage a certain sum when he ought to have reported that there was nothing due, was held by Mr. Justice Story to be quite untenable. 'It is too loose and general in its terms,' said he, 'and points to no particulars. It comes to nothing, unless specific errors are shown in the report; and those errors, if they exist, should have been brought directly to the view of

the court in the form of the exception itself. At present it amounts only to a general assignment of errors, and the argument on this exception has shown none.'

"The same rule was laid down in Story v. Livingston, 38 U.S. 13 Pet. 359 [10:200], wherein the exceptions to the report of a master were held to be too general, indicating nothing but dissatisfaction with the entire report; and furnishing no specific grounds, as they should have done, wherein the defendant had suffered any wrong, or as to which of his rights had been disregarded The court observed that 'exceptions to a report of a master must state, article by article, those parts of the report which are intended to be excepted to.' The court cited with approval the case of Wilkes v. Rogers, 6 Johns. 566, wherein it was said that exceptions to reports of masters in chancery are in the nature of a special demurrer; and the party objecting must point out the error, otherwise the part not excepted to will be taken as admitted."

Although *Sheffield & Birmingham* was decided at a time when the Master submitted his first proposed draft of findings to the attorneys, the requirements that the exceptions should be specific in detail certainly should apply here where we have a record of this magnitude with the numerous exhibits which have been introduced.

The Federal Reports are replete with decisions wherein the Circuit Courts of Appeal have held that, under Rule 53(e) (2) of the Federal Rules of Civil Procedure, the findings of a Master are entitled to great weight and if they are supported by substantial evidence and are not clearly erroneous, they should be approved and adopted. *U. S.* v. *S. Polpe & Co.*, 359 F.2d 132 (1st Cir. 1966); *Baker* v. *Simmons*, 325 F.2d 580 (1st Cir. 1963); *Teasdale* v. *Prosperity Co.*, 290 F.2d 345 (8th Cir. 1961). The

logic that the findings of the Master should be adopted unless clearly erroneous is soundly founded on the fact that the Master enjoyed the advantage of personally seeing and hearing the witnesses and thus is better able to judge their veracity and credibility and the trial or appellate court should respect this advantage. *Ferroline Corp.* v. *General Aniline & Film Corp.*, 207 F.2d 912 (7th Cir. 1953); *O'Hara* v. *Murphy*, 137 F.2d 154 (1st Cir. 1943); *Howard Industries, Inc.* v. *Ray Motor Corp.*, 293 F.2d 116, 117 (7th Cir. 1961).

II

CONTENTIONS OF THE STATE OF MISSISSIPPI AND THE STATE OF ARKANSAS

In the hearing before the Master and in their trial briefs, both states agreed to the legal principle that when a navigable river constitutes the boundary between two states, the middle of the main channel of the stream constitutes that boundary. This "middle of the main channel" has been variously defined as the thalweg or the sailing channel, being that channel customarily followed by navigation.

Both states also recognized the rule of law that where the course of a boundary stream changes through the operation of the gradual processes of erosion and accretion, that the state boundary follows the stream and remains in the varying center of the navigable channel.

Both states also conceded that where a boundary stream suddenly abandons its old bed and seeks a new one, such change, termed in the law "avulsion", works no change in the boundary, but in such instance the boundary remains fixed in the middle of the old navigable channel when it last ceased to be a flowing stream.

The testimony introduced by Mississippi shows that following the original government Land Office Survey of Arkansas, made in this reach of the river in 1823, the Mississippi River migrated gradually westward for approximately a mile, reaching its point of westernmost migration circa 1908-10. This line of maximum migration, or erosion westward, is marked on the ground by the relic of the right descending bank (Arkansas) of the Mississippi River referred to as the "bank of maximum recession". The main channel of the Mississippi River flowed westward, southward and easterly around Carter Point, Mississippi continuously from 1823 until 1935 when the Mississippi River was diverted from its former bed through the dredging by the United States Engineers of a new channel across the neck of Carter Point, which new channel was referred to throughout as the Tarpley Neck Cutoff of 1935. Both Mississippi and Arkansas conceded that this 1935 diversion of the river constituted an "avulsion". This river action is clearly shown on Exhibit P-1, attached as Appendix A p. 36 to the Master's Report.

The area in which the positions of Arkansas and Mississippi differ is as follows:

(1) Mississippi contends that the migration of the Mississippi River westward from 1823 to its bank of maximum recession, referred to above, was the result of the gradual processes of accretion and erosion and that at all times during this period, the thalweg, or sailing line, upstream from the problem area, was hard against the Mississippi shore (left descending bank), coming out of Miller Bend upstream from Carter Point. This thalweg, or line of navigation, followed the Mississippi shore for approximately half the distance of the northern side of Carter Point when it then "crossed over" to the Arkansas (right descending) bank of the river as it approached Span-

ish Moss Bend. Navigation ran Spanish Moss Bend by holding hard to the Arkansas bank until the distal end of Carter Point had been passed and then again crossed over to the Mississippi bank downstream through Batchelor's Bend. The opening of the Tarplay Cutoff in 1935 was an avulsive act, which fixed the state boundary in the old sailing channel or thalweg as it was located in 1935. This location is shown on Austin B. Smith's Exhibit P-2, Appendix B, p. 37 to the Report of the Special Master.

(2) Arkansas contends that there were *two* avulsions, one in the year 1871 and the other being the avulsion of 1935. Arkansas contends that there was no migration westward of the Mississippi River from 1823 until 1871 and that in the year 1871 the river suddenly left its former bed in Spanish Moss Bend and adopted a new bed to the west, leaving an island formation consisting of original Arkansas mainland between the old and new beds of the Mississippi River. This land formation is designated by Arkansas as being Luna Island. It is Arkansas' contention that while Smith's boundary line, Exhibit P-2, may be correct along the northern and southern sides of Carter Point, it is in error as it loops old Spanish Moss Bend and should be located somewhere between Luna "Island" and the western or distal end of Carter Point, Mississippi. Arkansas failed to introduce an exhibit showing with any degree of certainty her conception of where the state line should be located.

(3) Mississippi controverts Arkansas' contention as to the 1871 avulsion and contends that as the river migrated westward through the gradual process of accretion and erosion, that alluvion was deposited on the distal end of Carter Point as pointbar accretions. The growth of this accreted material was concomitant to and concurrent with the erosion of the Arkansas right descending bank. The existence and growth of this pointbar accretion is graphically shown

on the early river maps, The Western Pilot, 1825, Exhibit P-7, ibid, 1834, Exhibit P-8, ibid, 1841, Exhibit P-9, ibid, 1847, Exhibit P-10, James River Guide, 1856, Exhibit P-11; and particularly Lloyd's 1863 map, Exhibit P-17. Between 1863 and 1872 as shown on Douglas' 1872 map, Exhibit P-24, a shallow pointway channel first began developing across this pointbar accretion. This pointbar was attached to the Mississippi original Carter Point by a low land bridge which could be easily forded during low water stages and in fact, during 1894 was actually entirely above water when the Mississippi was at zero stage on the Arkansas City gage. Cattle crossed over from Carter Point to Luna Bar during low water up to the time of Tarpley Neck Cutoff. Navigation never used this pointway channel except during periods of extreme high water and then only by small boats of shallow draft. It is Mississippi's contention that this land mass, between the distal end of Carter Point proper and the Arkasnas bank, had its genesis as pointbar accretions and it is referred to by Mississippi as Luna Bar. It is a detached bar formation and not an island, as such.

III

BASIC LAW

(a) When, as here, a navigable river forms a boundary separating one state from another the live and varying thalweg, or middle of the main navigable channel, of that river marks the boundary between the states and is to be taken as the true boundary line.

As Mississippi and Arkansas came into the United States by their respective Acts of Congress, the Mississippi River was designated as their boundary.

In the Acts of Congress admitting Arkansas and Mississippi as states into the Union, "up the middle of the main channel of the Mississippi River" was the term used in Arkansas' act of admission (5 Stat. at 2, 50, 51, Chap. 100) and "up the river" was used in Mississippi's act of admission (3 Stat. at L, p. 348, Chap. 23), reference being made to the Mississippi River.

In interpreting similar statutes, where the state boundary is the river, *Iowa* v. *Illinois*, 147 U.S. 1, 57 L.Ed. 55, 13 S.Ct. 239, extensively reviewed the authorities on the subject and held:

> "[T]hat the true line in navigable rivers between the states of the Union which separates the jurisdiction of one from the other is the middle of the main channel of the river. Thus the jurisdiction of each state extends to the thread of the stream, that is, to the 'mid-channel', and, *if there be several channels, to the middle of the principal one, or, rather, the one usually followed.*" (Emphasis supplied)

In *Iowa* v. *Illinois*, supra, the following rule for establishing the location of the thalweg is quoted:

> "If there be more than one channel of a river, the deepest channel is regarded as the navigable mid-channel for the purpose of territorial demarcation; *and the boundary line will be the line drawn along the surface of the stream corresponding to the line of deepest depression of its bed.*" (Emphasis supplied)

In *New Jersey* v. *Delaware*, 291 U.S. 361, 78 L.Ed. 847, 54 S.Ct. 407, the following definition is given:

> "The Thalweg, or downway, is the track taken by boats in their course down the stream, which is that of the strongest current."

That there is no real conflict in the two definitions is demonstrated by the able discussion of the subject by Judge Sibley of the U. S. Court of Appeals, Fifth Circuit, in the case of *Anderson-Tully* v. *Tingle*, 166 F.2d 224, wherein it was stated:

> "It appears that the older cases speak of the 'center of the stream' or 'the thread of the current' as the boundary. The center of the stream is assumed to be the same as the thread of the current if it is not shown otherwise. In Iowa v. Illinois, 147 U.S. 1, the term 'thalweg' of the stream was used, and the later cases in Mississippi use that term, as did the district court. The word is German for 'valleyway' and means the lowest part of the river bed in the direction of its flow, or the deep channel of the river. It can be, and in making charts is, accurately located by transverse soundings. The thalweg and the thread of the stream are related as cause and effect. If the bed is hard, as rock, the thalweg will direct the thread of the stream. If the bed is sand and mud, the thread of the current will control the thalweg, shifting it by erosion as the current shifts. As boundaries the two signify the same thing, the thalweg being more accurately ascertainable. We will use that term."

The basis for the foregoing rule of the thalweg has been set forth by Justice Cardozo in the case of *New Jersey* v. *Delaware*, supra:

> "The underlying rationale of the doctrine of the Thalweg is one of equality and justice. 'A river', in the words of Holmes, J. (New Jersey v. New York, 283 U.S. 336, 342, 75 L.Ed. 1104, 1105, 51 S.Ct. 478), 'is more than an amenity, it is a treasure.' If the dividing line were to be placed in the centre of the

stream rather than in the centre of the channel, the whole track of navigation might be thrown within the territory of one state to the exclusion of the other."

In *Iowa* v. *Illinois*, supra, the Court stated:

"When a navigable river constituted the boundary between two independent states, the line defining the point at which the jurisdiction of the two separates is well established to be the middle of the main channel of the stream. The interest of each state in the navigation of the river admits of no other line. The preservation by each of its equal right in the navigation of the stream is the subject of paramount interest. It is, therefore, laid down in all the recognized treatises on international law of modern times that the middle of the channel of the stream marks the true boundary between the adjoining states up to which each state will on its side exercise jurisdiction. . ."

This Court has also stated, in *Arkansas* v. *Tennessee*, 310 U.S. 563, 571, 60 S.Ct. 1026, 84 L.Ed. 1362, 1367:

"The rule of the thalweg rests upon equitable considerations and is intended to safeguard to each state equality of access and right of navigation in the stream."

Thus, it is clearly shown that the rule of the thalweg has withstood the test of repeated efforts to change it to fit differing factual situations. As in the case with all rules of jurisdiction and property based upon justice and right, the rule of the thalweg has withstood the test of time.

Mississippi submits that the application of the rule of the thalweg by the Special Master as announced and fol-

lowed in all prior decisions of the Court to the undisputed facts of this case, should be determinative of this matter as it was in *Mississippi* v. *Louisiana*, supra.

(b) Where the course of a boundary stream changes through the operation of the gradual processes of erosion and accretion the boundary follows the stream and remains the varying center of the channel.

Missouri v. *Nebraska*, 196 U.S. 23, 25 S.Ct. 155, 49 L.Ed. 372, 374, enunciated the basis for the proposition stated above, as follows:

> "The former decisions of this court relating to boundary lines between states seem to make this case easy of solution.
>
> "In New Orleans v. United States, 10 Pet. 662, 717, 9 L.Ed. 573, 594, argued elaborately by eminent lawyers, Mr. Webster among the number, this Court said: 'The question is well settled at common law, that the person whose land is bounded by a stream of water, which changes its course gradually by alluvial formations, shall still hold by the same boundary, including the accumulated soil. No other rule can be applied on just principles. Every proprietor whose land is thus bounded is subject to loss by the same means which may add to his territory; and as he is without remedy for his loss, in this way, he cannot be held accountable for his gain.' It was added—what is pertinent to the present case—that 'this rule is no less just when applied to public than to private rights.' "

The classic definition of what constitutes accretion and erosion is found in the case of *County of St. Clair* v.

Lovingston, 90 U.S. 23 Wall. 46, 23 L.Ed. 59, where the Court held:

> "In the light of the authorities, alluvion may be defined as an addition to riparian land, generally and imperceptibly made by the water to which the land is contiguous. It is different from reliction, and is the opposite of avulsion. The test as to what is gradual and imperceptible in the sense of the rule is, that though the witnesses may see from time to time that progress has been made, they could not perceive it while the process was going on."

The operative words here are "see" and "perceive". Unless one can see and perceive changes in a river at the moment that they take place, then all such changes are by this definition accretive in nature and not avulsion. One can search from one end to the other of the voluminous record in this case, and one cannot find a shred of evidence that any of the changes which have taken place in this river could be seen and perceived while they were taking place other than following the Tarpley Neck Cutoff of 1935. Therefore, the migration westward of the river from 1823 to 1900 *circa* must be classified as accretion and erosion.

This Court has applied the visible and perceptible test in all cases where it has been applicable. Where additions to the banks of a stream are not visible while the eye rests upon the stream, this Court has held that the law of erosion and accretion applies. Some of the cases wherein the test has been applied are: *Missouri* v. *Nebraska*, supra; *Arkansas* v. *Tennessee*, supra; and *Oklahoma* v. *Texas*, 260 U.S. 606, 67 L.Ed. 428, 43 S.Ct. 221.

However, the same conclusion can be reached by stating the proposition in reverse, that there was no avulsion.

Accretion or alluvion "is the opposite of avulsion", *St. Clair* v. *Lovingston*, supra. In other words, if the change did not take place as the result of an avulsion, it must, *ex vi termini*, have taken place as a result of accretion and erosion.

Thus we see that the law recognizes no halfway house. If there was no avulsion in the area in controversy, as the same has been defined by the courts, then the changes have been the result of accretion and erosion. There will be no alternative than to adopt the Master's finding for Mississippi. Otherwise, principles of law which have been handed down over the centuries and which constitute rules of property will be radically changed.

(c) Definition of Avulsion

Avulsion is defined most succinctly in *Nebraska* v. *Iowa*, 143 U.S. 359, 361, 36 L.Ed. 186, 188:

> "It is equally well settled, that where a stream, which is a boundary, from any cause *suddenly abandons its old and seeks a new bed*, such change of channel works no changes of boundary; and that the boundary remains as it was, in the centre of the old channel although no water may be flowing therein. This sudden and rapid change of channel is termed, in the law, avulsion . . ." (Emphasis supplied)

Actually, the river is the state boundary. The thalweg merely marks the precise geographical location within the bed of the river where the boundary is to be fixed at any given time. The thalweg is an abstract legal concept only and not a concrete and living thing like a river. It is merely "the line at which the jurisdiction of the two separates . . . when a navigable *river constitutes the boundary* . . .", *Iowa* v. *Illinois*, supra.

As was stated in the opinion in *Nebraska* v. *Iowa*, supra:

> "But, on the other hand, if *deserting its original bed*, the river forces for itself a new channel in another direction, then the nation, through whose territory the river thus breaks its way, suffers injury by the loss of territory greater than the benefit of retaining the natural river boundary, and that boundary remains in the middle of the deserted river bed. For, in truth, just as a stone pillar constitutes a boundary, not because it is a stone, but because of the place in which it stands, so a river is made the limit of nations, not because it is running water bearing a certain geographical name, but because it is water flowing in a given channel, *and within given banks*, which are the real international boundary." (Emphasis supplied)

The above definitions, along with many others, make it clear that when the Courts speak of an avulsion, they are referring to changes involving the river seeking an entirely new *bed*.

This is manifest in the following quotation from Vattel, one of the fathers of International Law, which is contained in the opinion of the Supreme Court in *Nebraska* v. *Iowa*, supra, as follows:

> "But if, instead of a gradual and progressive change of its bed, the river, by an accident merely natural, turns entirely out of its course and runs into one of the two neighboring states, *the bed* which it has abandoned becomes thenceforward their boundary, and remains the property of the former owner of the river (Sec. 267), and the river itself is, as it were, annihilated in all that part, while it is reproduced in

its *new bed* and there belongs only to the State in which it flows." (Emphasis supplied)

A definitive summary of the rules regarding accretion and avulsion as applied by the Supreme Court is given in the case of *Arkansas* v. *Tennessee*, supra, as follows:

> "It is settled beyond the possibility of dispute that where running streams are the boundaries between states, the same rule applies as between private proprietors; namely, that when the *bed and channel* are changed by the natural and gradual processes known as erosion and accretion, the boundary follows the varying course of the stream; while if the stream from any cause, natural or artificial, *suddenly leaves its old bed and forms a new one*, by the process known as an avulsion, the resulting change of channel works no change of boundary, which remains in the middle of the old channel, although no water may be flowing in it, and irrespective of subsequent changes in the new channel." (Emphasis supplied)

The opinion in *Oklahoma* v. *Texas*, supra, restates the above language quoted from *Arkansas* v. *Tennessee*, supra, and also defines what is meant by the "bed" of a river, as follows:

> "When we speak of the bed, we include all of the area which is kept practically bare of vegetation by the wash of the waters of the river from year to year in their onward course, although parts of it are left dry for months at a time; . . ."

IV

EVIDENCE SUPPORTS THE POSITION OF MISSISSIPPI AND REFUTES THAT OF ARKANSAS

Contrary to Exception No. I in Arkansas' Brief, the testimony elicited through Austin B. Smith, Engineer and Potamologist; Dr. Charles R. Kolb, Geologist; Walter Guyer and J. S. McKnight, Foresters; J. C. Smith, eye witness to the events since 1930; and Captain H. C. Muirhead, veteran Pilot, leaves no room for question but that Luna Bar formed as pointbar accretions to Carter Point, Mississippi, and that the state line as depicted by Austin B. Smith is the correct boundary between Mississippi and Arkansas as fixed by the avulsion of 1935. The great mass of ancient maps, official governmental reports and natural phenomena irrefutably establishes the correctness of this position. Certainly it furnishes substantial evidence which would require an approval of the Master's finding. We will discuss briefly this testimony.

TESTIMONY OF AUSTIN B. SMITH

Smith, a registered professional engineer in Mississippi and Louisiana, spent his entire professional life since 1930 working exclusively with the Mississippi River and its tributaries (TR-359). His training and work encompassed on-the-ground soil borings for levee formations (TR-360), work in the field of hydraulic surveys, dredging, revetments, construction of pile dikes (TR-361), navigation and cutoff construction and design. During the critical period of the opening of Tarpley Neck Cutoff, he was actually concerned with the dredging during its construction (TR-362). In 1935, he transferred to the Mississippi River Commission and has served as Assistant to

the Chief of the Hydraulic Branch, Chief of the Dredging and Navigation Branch and then Chief of the Construction Branch. He served on the first Potamology Board which was created in 1942 (TR-363).

In addition to his work with the United States Engineers and the Mississippi River Commission, in his private practice he has been consultant on numerous water boundary problems of the Mississippi River and eight other rivers across the United States. His qualifications, including a list of his scientific papers and professional associations, appear on pages TR-365 through TR-368.

In addition to his broad general background and knowledge of the problems of the river, he has especially detailed and comprehensive knowledge of the regimen of the river in this particular area. He first became acquainted with the Carter Point area in 1935 and in 1954 made a study for Chicago Mill and Lumber Company to divide the respective accretion lands of Chicago Mill and Anderson-Tully Company at Carter Point. In 1963, he was employed by the State of Mississippi to determine the state boundary in Spanish Moss Bend in connection with criminal proceedings instituted by the State of Mississippi and subsequently studied the same area in connection with testimony given in the Federal District Court at Greenville, Mississippi in 1965 and in the Chicot Chancery Court proceedings at Lake Village, Arkansas in 1967, and finally for the preparation for giving his testimony and professional opinion in this case. His investigation into all available data was intensive and exhaustive (TR-382-383).

Smith divided his study into four time segments.

(1) 1821-1860 (TR-389 to 413)

He traced the history of the river, from the earliest official documentary evidence, the 1821 Young Survey of the Mississippi River, Exhibit P-3 (TR-389), through 1860. At all times the bend at Carter Point is shown as a rather tight meander and the conditions are such that you would expect erosion to continue in the bight or axis of this bend. There is no evidence of any detached bar or island formation around Carter Point Peninsula and there is a single undivided channel in that area. Normally, in the bight of the bend such as shown opposite Carter Point, there is gradual and progressive caving. This would be the normal situation in a bend such as that depicted on the 1821 Young Survey (TR-393).

Smith's Exhibit P-4 is a composite of the four township maps of Chicot County, Arkansas and Washington County, Mississippi and illustrates the river conditions in 1823-1830 (TR-394). These official GLO plats show that there was no divided flow of the river in 1823 and by the geometry of the river, you would expect caving along the right descending Arkansas bank in fractional Sections 9 and 16.

Smith then introduced and discussed a series of ancient maps which were contained in publications which gave directions for sailing the Mississippi River (TR-396-397). These publications are as follows:

The Western Pilot, 1825	Exhibit P-7
The Western Pilot, 1834	Exhibit P-8
The Western Pilot, 1841	Exhibit P-9
The Western Pilot, 1847	Exhibit P-10
James River Guide, 1856	Exhibit P-11

These maps depicted a river situation with accretions forming against Carter Point, with navigation holding hard against the Arkansas bank in Spanish Moss Bend and no evidence of a detached bar or island formation.

(2) 1860-1894 Period (TR-413-478)

Lloyd's 1863 map, Exhibit P-17 (TR-441) clearly shows the normal pointbar accretions being laid down against or at the distal end of Carter Point, the genesis of the formation that was later called Luna Bar, and such bar formation would be consistent with the normal regimen of the Mississippi River in a bend such as Spanish Moss Bend (TR-413).

The latest map prior to 1870 (Arkansas contending that an avulsion occurred in 1871) was McFarland's Map of portions of Desha and Chicot Counties of 1865, Exhibit P-19 (TR-415). McFarland was the agent of the Treasury Department, which was the agency responsible for the rehabilitation of the South following the Civil War. The Treasury Department had taken over the abandoned plantations and McFarland was its leasing agent (TR-416). There is no indication of a divided flow in Spanish Moss Bend, and Spanish Moss Bend and Carter Point have retained their essential configuration, indicating a typical pointbar building and caving bend situation.

More important to the solution of our problem, however, than the maps were the reports to Congress by General Humphreys dated June 11, 1866, and the subsequent Humphreys and Abbot's Report, dated February 20, 1869. By way of background, Congress passed the 1850 Swampland Act and the State of Arkansas, taking advantage of this donation of lands, constructed state levees along the Mississippi River during the period 1852-1860 (TR-399). During the Civil War and its subsequent turmoil, the old

state levees fell into a state of disrepair. General Humphreys was assigned the task of reporting on the condition of these levees. Humphreys' report verified that the Arkansas bank in Spanish Moss Bend had gradually caved over the years. This was what would normally be expected in a concave bend opposite a pointbar. The historical testimony of General Humphreys (TR-418, 420), speaking through his report to Congress, in part, is as follows:

> ". . . This alluvial district extending from Gaines Landing to the mouth of Red River, its area is 4,000 square miles. The levees of the narrow strip of alluvial land between Gaines Landing and the boundary line of Arkansas-Louisiana are in very bad condition. Some of the lengths of the breaks, nine in number, amount to six miles, mostly of high levee. The levee is besides much worn in many places. In the bend above Columbia the bank is caving badly." (This would be Spanish Moss Bend.)

The subsequent February 20, 1869 Report of Humphreys and Abbott to the 41st Congress, Exhibit P-134, brings this situation down to date as follows:

> "It is to be regretted that the report of recent survey, 1866 and 1867, made in Chicot County, Arkansas, under direction of the Levee Board of Louisiana to throw light on the problem is not at hand. In the winter of 1865-1866 these levees were in very bad condition. It is believed that they are even worse at present. There were then seven breaks between the Louisiana line and Columbia requiring about 380,000 cubic yards of embankment, costing about $156,000.00, and four breaks between Columbia and Gaines Landing would require about 350,000 cubic yards of embankment costing about $140,000.00. The levees still

standing were much worn in many places and the river is badly eroding its banks in the bend above Columbia." (TR-421).

Douglas' 1872 Map, Exhibit P-100, shows the bank line of 1872, the 1823 Arkansas meander line and the breached levees. Douglas depicts Luna Bar as being well to the east of the 1823 meander line close against the Mississippi shore. Douglas' survey of 1872, made long before this litigation had developed, completely confirms Austin Smith's opinion and the Master's finding that the Arkansas bank caved gradually and imperceptibly from 1823 to 1872 as the river migrated westward, and also confirms the on-the-ground examination of General Humphreys as detailed in his reports to Congress.

If Luna Bar had been formed by an avulsion, it would have been necessary for Luna Bar to be depicted by Douglas as being located between the 1823 meander line and 1872 top-bank and some remnant of the old state levee should have been visible on Luna Bar in some of the maps during the time period 1872 to the 1882 hydrographic survey. But none is shown.

When you compare the size of Luna Bar as depicted by Douglas in 1872, Exhibit P-100, and its size and location as depicted by Suter on his 1874 map, Exhibit P-25, the speciousness of Arkansas' contention becomes immediately evident. There simply was not enough area between the state levee described by General Humphreys and the 1872 bank line as surveyed by Douglas to permit the occurrence of the avulsion claimed by Arkansas. Compare Suter's map, Exhibit P-25, which shows a wide channel to the west of Luna with the sailing line hard against the Arkansas bank, with the 1882 hydrographic survey, Chart No. 39, Exhibit P-26.

Further, the remnant of the old 1872 state levee is still in place at Luna Landing, approximately 400 feet back from the Arkansas bank, and it is clearly discernible (TR-436). Arkansas' witness, Dr. Durham, agrees: "The position where the levees were breached in Douglas' time is in this area and still preserved. It is possible to walk these old levees . . ." (TR-992). These same levees are shown in the same identical geographical position on the 1882 Map of the Mississippi River Commission, Chart No. 39, Exhibit P-30, 1913 Survey (TR-440, 441).

The 1872 and 1874 reports made by Captain H. R. Richardson for the Louisiana Levee Commission and by Mr. Jack E. Sickels, civil engineer, deal with the levee system in Spanish Moss Bend. Both reports confirm the bank caving situation described by General Humphreys (TR-443, 444). On page 58 of Sickels' report, Sickels states that in the bend below Gaines Landing and above Luna "the banks are steadily caving", Exhibit P-27 (TR-445). Neither Richardson's report to the Levee Commission nor Sickels' report on the Mississippi River levees make any mention of such an unique or extraordinary natural phenomenon as an "outside avulsion" in this area. If such a thing had happened, it is incredible that some mention would not have been made in these two detailed reports which were directly concerned with the caving bank situation in Spanish Moss Bend and the integrity of the levee system. Sickels prepared a map to accompany his report, Exhibit P-28, and he agrees with Douglas and places Luna Bar well to the east of the line of levees, locating the west line of Luna Bar east of the 1823 Arkansas shore line, again furnishing irrefutable proof that Luna had its genesis as pointbar accretions, starting in 1863 with Lloyd's Map, Exhibit P-17, and subsequently being detached from Carter Point proper by over-bank scour. Lloyd's 1863 Map and

Sickels' 1874 Map both show the course of navigation to the north and west of these sandbar accretions (TR-449-450).

If there were ever any question about Luna Bar being pointbar accretions as opposed to Arkansas' contention that it is a remnant of the Arkansas high-bank, this question has been put to rest forever by the MRC Survey of 1882, Exhibit P-30. This survey was made by the Mississippi River Commission and it is a controlled survey and is the first trigonometric survey made of the Mississippi Valley. It is tied into longitude and latitude by a series of triangulation nets up and down the Valley. All subsequent MRC surveys and U. S. Engineer District surveys use this same trigonometric system of grids. This chart, as explained by the witness Smith, proves that when the River was at zero feet on the Arkansas City gage, dry land will connect Luna Bar to Carter Point. Even at 4 feet on the Arkansas City gage, that part of the bed of the river where the sounding was 6 feet or less would all be dry land. This was graphically portrayed by Smith on his Exhibit P-33 on which he took the base 1882 survey and contoured and colored all that part of the bed of the Mississippi River which would be dry land when the gage was zero at Arkansas City (TR-454-456). So we see that at the time of the first controlled survey showing the soundings of the Mississippi River, Luna Bar was firmly attached to Carter Point, Mississippi in 1882 and the thalweg or sailing line was to the west of Luna Bar close to the Arkansas shore.

The 1882 Chart, Exhibit P-30, further furnishes mute evidence of the origin of Luna Bar. Throughout its entire length and breadth, the legend "sand" appears. Its composition is identical with the sandbar, pointbar attached accretions to Carter Point shown on this same chart. It is completely devoid of timber and its topography is en-

tirely different from that of the Arkansas overbank, which consists of cultivated fields or timber.

The 1894 Hydrographic Survey, Exhibit P-34, also depicts Luna Bar as a dry sandbar with no vegetation. If the water level at the time of the survey had been three feet lower, Luna Bar would have been attached by dry land to Carter Point (TR-476). The thalweg and sailing channel is between Luna Bar and the Arkansas bank and the passing lights put out by the Coast Guard are along the Arkansas bank (TR-477-478). At bankfull stage in 1894, Luna Bar at reference range A-"A" would be 15 feet under water (TR-478).

(3) 1894-1935 Period (TR-476-497)

Exhibit P-36, the 1925 Hydrographic Survey, is the first indication of any vegetation on Luna Bar and it is indicated by the legend "willows and young willows" on the east side toward the lower half. With this exception, Luna Bar is a dry sandbar and the crest along reference point A-"A" is comparable to that of 1913 (TR-483) with the Bar standing in 15 feet of water at bankfull stage (TR-480).

Exhibit P-38 is the earliest aerial photograph showing Luna Bar and is dated 1930. It shows the small patch of willows on the extreme south end of Luna Bar as located in the 1925 survey, but the patch of willows is smaller than it was in 1925 and the remainder of the bar is patently a low, dry sandbar.

Between 1925 and 1933, the major floods of 1927 and 1929 occurred causing the erosion of a large portion of the east side of Luna Bar. Although the pointway channel between Luna Bar and Carter Point has widened considerably, the elevation of the bed has increased by approxi-

mately two feet at reference line A-"A". The 1927-29 floods caved approximately 1,500 feet off of the east side of Luna Bar, destroying the willows first shown on the 1925 Hydrographic Survey (TR-492). Exhibit P-39, the aerial mosaic of 1932, depicts two towboats, circled in red, running Spanish Moss Bend between the Arkansas bank and Luna Bar (TR-497).

(4) 1935-1972 (TR-497-503)

Exhibit P-42, the 1938 aerial mosaic, completes the graphic history as depicted by these maps and shows Tarpley Neck Cutoff as having been fully developed and filling is taking place in the upper arm of abandoned Spanish Moss Bend (TR-498). Navigation is now in Tarpley Neck Cutoff. The 1930 willow patch has caved into the River, but its former location is marked by a red circle in the bed of the now abandoned river.

These official maps furnish irrefutable proof of the gradual imperceptible growth to Carter Point by the process of accretion of the lands subsequently known as Luna Bar. From 1823-1930, the accretion formation had extended the distal end of Carter Point as shown by Lloyd's 1863 Map, Exhibit P-17, and by Douglas' 1872 Map, Exhibit P-24, and the river had migrated and eroded the Arkansas bank westward in Section 9 with a corresponding building of Carter Point westward. During this period the sailing line is close along the Arkansas bank as shown by the river maps, the soundings and the navigation lights. Between 1872 and 1882, Luna Bar has built downstream slightly and to the west.

From his study of these historical documents and maps, the Potamologist Smith concluded:

"Luna Bar, as we have pointed out, had its genesis about 1863 along the distal and north side, the distal end and north side of Carter Point, which is shown on Lloyd's Map, and is subsequently enlarged westward and built downstream a small amount, but in this process the navigation course and the thalweg of the river has always been between Luna Bar and the Arkansas Bank . . . it (Mississippi River) caved it (Arkansas bank) back from the 1823 bankline, as shown by the 1823 meander line on the GLO plats, and the midpoint of Section 9, it caved it back an ultimate distance of about 3,600 or 3,700 feet, that is, the maximum bankline." (TR-466-467)

The Special Master correctly concurred.

These maps, modern and ancient, the on-the-ground conditions, the quality of the soil and the variation in elevation of Carter Point-Luna Bar accretions, all amply and conclusively support the finding of the Special Master that Luna Bar had its genesis as pointbar accretions to Carter Point, Mississippi.

V

RESPONSE TO POINT II OF ARKANSAS' BRIEF, THE PHYSICAL FACTS ASSOCIATED WITH LUNA BAR CONFIRM THE MASTER'S FINDING

We submit that this case could and should be decided entirely upon the testimony afforded by the ancient and accurate maps and surveys which were introduced and commented on above, together with the reports made by General Humphreys, Engineer Richardson and Engineer Sickels in their study of levee conditions in Spanish Moss Bend in the time span 1866-1874. However, the timber stand on Luna Bar completely substantiates the Master's

finding and should be noted. In the case of *Ussery* v. *Anderson-Tully Company*, 122 F.Supp. 115, 121, the court had this to say:

> "Accurate maps and charts are, of course, indispensable in cases like the instant one, since in most of such cases the crucial movements of the river have not been observed by living witnesses. If all of the maps of the Arkansas River were accurate in detail, and if the chronology of such maps were complete and close, solution of problems of this kind might be fairly simple in this area. Such, however, is not the case.[1] What maps are available are far apart in point of time, and some of them are meager in detail. The official maps prepared by the Corps of Engineers or by the Mississippi River Commission, however, are accurate maps, and their depictions are prima facie correct. Crow v. Johnston, 209 Ark. 1053, 1059-1060, 194 S.W. 2d 193.
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> "It is obvious that physical evidence on the ground is of the utmost importance in the determination of these cases; ordinarily, if the theory of one expert as to the nature and origin of the area in controversy is correct, it will find corroboration on the ground in the presence or absence of a lake, a meander scar, recognizable old bank lines, or other topographical features; on the other hand, a theory which is not supported by physical evidence is subject to grave doubt as to its correctness, regardless of the eminence of the potamologist who may propound it. Where, as here, the primary question is the determination of which

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1. Considering the passage of time, it is remarkable that so much documentary evidence was available. Exhibits P-4 through P-29 show that the longest time span in which there is no recorded, documented proof of the geographical conditions in this area was the six-year period 1841-1847.

of two former river banks was the source of origin of the area in controversy, it becomes most important to consider the species and distribution of the timber throughout the area. This is true because timber does not spring up haphazard on newly formed lands, but follows a rather definite pattern of appearance, growth, maturity, death, and succession. The *types of trees* which first appear and establish themselves are known as 'primary species'; those which follow are referred to as 'secondary species'; and these, in turn, are followed by the 'climax species' which will make up the *permanent forest* on the land as long as the climate remains unchanged.

"When accretions are formed in the alluvial river bottoms in the lower Mississippi Valley, they are at first simply mud and devoid of vegetation. As time goes on, however vegetation appears thereon and in time trees are established. The first species to occur are willow and cottonwood, which are tolerant of water, and which receive in such locations supplies of sunlight adequate to their needs; while willow and cottonwood are tolerant of water, they are intolerant of shade and will not establish successive stands in the same location. As the willow and cottonwood grow to maturity, the secondary species, such as sycamore, elm, hackberry, ash, pecan, and other types, which are more tolerant of shade, spring up beneath the willow and cottonwood, and as the latter disappear, the secondary species take over, to in turn, give way to the climax species, usually, oak, hickory, or gum, the seedlings of which grow readily in the shade of their parent trees.

"The length of time that it will take for this succession of *timber types* on newly formed lands to progress

from the *primary to the climax type of forest* is obviously subject to considerable variation depending upon a number of factors, and it should always be kept in mind that the pattern is subject to some variation. It may be safely said, however, that *once a forest* is established on an alluvial deposit, it will proceed toward, and eventually reach, a climax in types and its progress in that direction can be observed by the trained forester and in certain cases even by the layman. The application of this principle to accretion cases can be summed up in the statement, 'The timber follows the accretion'; that is to say, the land first formed is covered by the more advanced *types of timber*, and if the direction of the progression of the *timber types* can be ascertained, the relative ages of the various portions of the area can be logically inferred. In view of the importance to be attached to the *forestation* of the area in controversy in certain cases, it is clear in such cases the testimony of experienced foresters and dendrologists ranks in importance with that of engineers and surveyors." (Emphasis supplied)[2]

W. H. Guyer, a forester of much experience and training, had knowledge of the area as far back as 1940 (TR-38, 59), at which time there was some young willow on Luna Bar. In the early 50's, he conducted logging operations on Carter Point and at that time observed young willow and cottonwood under log size on Luna (TR-61). In the early 60's, he made a timber cruise on Luna Bar and

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2. We have italicized the references to "types" and "forests" because of the importance of distinguishing between individual trees which can appear in isolation or in clumps as against the stand or forest which consists of individual trees. Frequently, these individual *trees* can be found scattered through a *forest* of a different succession.

Carter Point and prepared a cruise map which appears as Exhibit P-54. In 1965, he ran certain survey lines on the Arkansas bank and also on Luna Bar, which he depicts on his map, Exhibit P-51 (TR-79-80).

From his examination of the timber growth and from his experience as a forester, he found the principal timber on Luna Bar to be of the primary stage, with some secondary and a few trees in the climax species. He testified that in the emergence of timber on alluvial soils there is a definite pattern (as discussed by Judge Ussery, supra).

After vegetation becomes established, the life of the forest consists of three successive stages, but it is difficult to tell when one stage is completed and when another stage commences. These three stages are primary, secondary and climax. The willow and cottonwood are the primary type. Soft elm, sycamore, hackberry, box elder and several other types are generally included in the secondary species with generally oak, gum, elm and others comprising the climax species (TR-101).

In conclusion, Guyer found the vegetation on Luna Bar to be of a primary type of willow and cottonwood. No trees were found to be over 36 years of age and only a few had reached that age. The general age was between 20 and 30 years. From his experience on the river and as a forester, it was his opinion that it took Luna Bar approximately 40 years to reach a stage where it was susceptible of sustaining a growth of trees (TR-108).

Similarly, Mr. J. S. McKnight, an outstanding authority on timber in the Mississippi Alluvial Valley, corroborated Guyer's testimony as to the age and type of timber on Luna Bar. Mr. McKnight used an increment borer to determine the ages of the larger and apparently older trees. The oldest tree that he found was a cotton-

wood 37 years of age (TR-142). Without going into detail, Mr. McKnight testified to the same succession of species as did Mr. Guyer. Arkansas is not entirely correct in stating that McKnight did not go upon the high area of the island, but only went on the "south end of Luna Bar and the eastern side, but did not go on the high area, the north or west side."

He followed Guyer's reference line A-"A", Exhibit P-54, "from the Arkansas River levee to the high bank of Carter Point in Mississippi" (TR-115) and he "viewed the forest on each side of the line and also walked and observed other places on this particular point." (TR-116). Reference to Exhibit P-54 shows the line completely crossing the bar and going over the high part, which McKnight describes as "a hump of sand, covered with sandbars and bermuda grass and came into another stand of timber on the other side of this hump going east." (TR-118).

From Point C, Exhibit P-54, "practically in the center of Luna Bar, and from there I proceeded north along a line" crossing and re-crossing a road observing the timber (TR-120). He bored a cottonwood near the center of Luna and determined its age as 36 years (TR-121). This testimony refers to his first examination of Luna.

McKnight made a second examination of Luna "to look more closely at the south and east edge in the center of Luna Bar" (TR-141) at which time he aged a cottonwood tree relied upon by Arkansas' witness Thompson and found its age to be 37 years (TR-142). Stumps of cypress trees along the Arkansas side of the relic of old Spanish Moss Bend, west of Luna Bar, which he saw on his first trip (TR-92), he more exactly located on aerial photographs (TR-144).

The second trip was quite comprehensive:

"Q. On your second trip to the island, did you (490) go over any other parts of the island? On your second trip? Travel over any other areas? (Handing witness Plaintiff's Exhibit P-51). A. I think that I will need to point out the area that I walked over—(Pointing to said Exhibit P-51)—I walked over this area all through here and proceeding on through here to this high bank—(interrupted)

"Q. Excuse me, Mr. McKnight, the record won't be able to see that—you are now pointing to the reference line on your Exhibit Number P-51, or the survey line, will you state the points on the exhibit? A. From Point A to Point C. Right here. And, we returned to C and proceeded from C to F. And, I made another trip with Mr. Guyer and walked in from a point on Pointway Channel, that would be a little below the reference line of the South reference line and proceeded in this fashion, which is—since the record will not show the map itself—to the east side of Luna Bar all the way to an intersection of the original reference line C to F, to a point where it met Spanish Moss Bend on the north of Luna Bar. And, then proceeded down the west bank (491) of Luna Bar to a little strip of sapling size Sycamore and into the edge of the sand area and on around the edge of Luna Bar to the Southwest and to the South and out to the point of Luna Bar where I left Luna Bar. Now, that was the additional trip to Luna Bar.

"Q. Did you circle the edge of the island? A. Not the exact edge, but about an eighth or a quarter from the edge—an area of possibly a quarter. Of a mile."

So when Arkansas lifts out of context McKnight's statement:

> "Now, I only went on the south end of Luna Bar and the eastern side. I did not go on the high area the north or west side."

it is obvious that McKnight is simply saying that on the *second* trip he did "not go on the high area the north or west side" (TR-148) having covered this area on his first visit as testified to above.

Nor is there any real contradiction by the foresters introduced by Arkansas. Mr. John Putnam, forester for Arkansas, testified on cross-examination that technically, a type of forest is a typical association of species (TR-570), which is found competitively in the woods. When you speak of a young or an old forest, you are talking about the preponderance of trees, since a forest is a community and judged as a whole. When the pioneer species of cottonwood and willow comprise the over-story of a forest and the secondary species are coming up as an under-story, the forest nevertheless, would be classified as a primary species as long as the forest over-story of primary species hasn't been broken (TR-571). Willow and cottonwood are the first to arrive on alluvial land, since they both must have mineral, soil and full sunlight and moisture at the time the seeds hit the ground (TR-577). He is very familiar with the typical pointbar formation where alluvium has been deposited by the river against (TR-578) the distal end of a point. The pointbar develops as sand or silty sand and then as succeeding rises in the river occur, fine silt and other material is deposited on the sand. This phenomenon takes a period of years to occur, and although it is very rapid geologically, this phenomenon would take something like 15 to 20 years up for the sandy

soil to convert to silt or other material, which would be capable of sustaining vegetation. The cottonwood and willow are the first type of trees that become associated with the pointbar formation (TR-579). Cottonwood, in some situations, will start almost simultaneously with willow, although it comes in generally fairly soon after the willow is underway and will grow up through the willow if the willow is on a favorable cottonwood site (TR-582). Under favorable conditions, the cottonwood will grow six to eight, maybe ten feet, in the first year and once established, the average growth in height per year is five, six or seven feet. Thus a 50-foot tall cottonwood is a relatively young tree (TR-583).

Putnam admitted that it is axiomatic in connection with the growth of a forest on a pointbar composed of alluvium, that, even though you have a predominant willow and cottonwood forest starting at the same time, you will get the secondary species starting in simultaneously as an under-story. The secondary and primary species are all mixed together into a hodge-podge of different trees (TR-585). It is not uncommon for the secondary species and even the climax species to come in scattered and isolated simultaneously with the willow and cottonwood. On an alluvial pointbar formation where cottonwood and willow are predominant and cottonwood and willow are partway along in their development, one would expect to see trees of the secondary and climax succession (TR-587). From his inspection of the area, the only thing that he found on the ground which would indicate any timber growth over 44 years was the cottonwood around the rim of the sandy plateau, which he believed went back to the 1927 flood and would probably be 44 years old (TR-604). On the trailing ridge to the south, he believes most of the trees are 30 to 40 years old (TR-607).

The majority of the trees on Luna are approximately 35 to 40 years old (TR-626). This corroborates exactly the evidence as to tree origination and growth as conclusively proven by the 1913 Hydrographic Survey, Exhibit P-35, the 1925 Hydrograph, Exhibit P-36, showing for the first time "willows and young willows" on Luna Bar, the 1930 Aerial Photo, Exhibit P-38, showing a small patch of willows on the extreme south end, and the 1938 aerial mosaic, Exhibit P-42, which shows the 1925-1930 willow patch eroded away with a new stand just coming into being.

On pages 7 to 11 of his Report, the Special Master reviewed the testimony as to the forest and its individual trees and concluded, as did Judge Clayton in *Anderson-Tully Company* v. *Walls*, 266 F.Supp. 804 (N.D. Miss. 1967) that:

> "[I]n sum, the weight of the evidence as to vegetation is that the bar is overwhelmingly composed of the pioneer species, but with scattered isolated trees of the secondary group, and on occasion—a young tree of the climax species." 266 F.Supp. at 810.

VI

GEOLOGY OF LUNA BAR SUPPORTS THE MASTER'S FINDINGS

In Point III of its exceptions Arkansas asserts that "The geology of Luna Bar completely negates the theory of the State of Mississippi and the Report of the Honorable Clifford O'Sullivan that the Island is the product of a pointbar migration." Far from negating the findings of the Special Master, the evidence submitted by Mississippi's expert geologist, Dr. Charles R. Kolb, proves the genesis of Luna Bar as pointbar accretions to Carter

Point, Mississippi, while the testimony given by Arkansas' experts, Dr. Clarence O. Durham and Spillers fail to so much as raise an issue of fact on this point. Durham and Spillers "theorize" that Luna was created as an "island" by the avulsive action of the river and this was accomplished, Durham asserts, by "[a]n abrupt shift in the western bank line of the western channel in a one-year interval. In association with this, the island came into being" (TR-989). To accommodate this theory it was necessary to "[a]ssume that the high waters scoured out the channel there which had been abandoned on the western side", but Durham conceded it had been impossible to establish such a flood, nor could he find any evidence of such an "abandoned channel" (TR-1033-1034). The Special Master failed to find any evidence in the record of an 1872 flood or an abandoned channel (M.R.-27, 32). We have found none in the record, nor has Arkansas assisted us by pointing out where in the transcript this missing evidence can be found. So, Arkansas' theory remains an assumption without proof to sustain it.

The testimony of Dr. Kolb proves that Luna Bar had its genesis as the result of the normal action of a meandering river. Dr. Kolb, who is Chief of the Geology Branch of the Waterways Experiment Station, U. S. Corps of Engineers, and whose qualifications are impressive (TR-255-264) testified:

> "I concluded that Luna Bar was a Point Bar deposit, which had accreted to the growing bend that was part of Carter Point, and it was bounded on the west by Spanish Moss Bend; that this was all part of the same Point Bar formation, formed by gradual accretion to a growing bend." (TR-265).

All of the geologists who testified are in agreement that the Mississippi is a meandering alluvial stream

coursing through an alluvial flood plane. It is one of the facts of life about the Mississippi River that it writhes through its valley like a snake. This phenomenon was described by Dr. Kolb as follows:

> "Meandering means that the river has a sinuous pattern, an 'S' shaped pattern. I don't believe there is any alluvial stream truly straight. A stream such as the Mississippi and many other alluvial streams, if you straighten it, will begin to develop a sinuous pattern in very short order. It will begin to cut at one bank and to fill at the point opposite that bank."

These bends are connected with a straight stretch of river called a "reach" and the thalweg or deepest part of a stream normally is against the concave bank, becomes shallow in the reach and deepens again against the next concave bank downstream. The "thalweg always hugs the concave bank" (TR-271).

> "During normal or ordinary flows, the thread of maximum surface velocity stays on the concave or outside portion of the bend; that as the river goes into higher stages, particularly flood and over-bank flows, at the time when avulsions occur, the thread of maximum surface velocity shifts from the concave bank toward the convex Point bar side of the river." (TR-373).

Dr. Kolb then described the "scouring" effect of the river, caving out material from the concave bank and carrying it downstream to be deposited against a pointbar downstream, thus building the bar out by the process of accretion (TR-276).

> "The scour pool, the word I have just used, is usually hard against the bottom, the base of this concave bank. When the river begins to rise, as the

river goes up, this level goes up, this scour pool begins to scour deeper, and the bottom of the river goes down at those bends. Tremendous quantities of material are carried out of this area down stream. There is also carried from this concave bank, as it erodes, particularly during these flood flow, and as it erodes, this material is also carried down stream. It is this material that goes down stream, and builds or accretes to the Point Bar areas." (TR-275).

Kolb used his Exhibit P-81 to show how a detached pointbar, such as Luna Bar, is formed (TR-285). His testimony in this regard is as follows:

"P-81. This shows what I think and what others think is the reason for the formation of a detached bar such as Luna Bar. I might point out that many, many such features occur along the river. Almost every third bend in the Mississippi River has some sort of bar develop and many of them have detached bars such as you see here. The reason for their being is reasonably simple, I believe, in that it comes back to this point that maximum surface velocities stay within or next to the concave bank during low water normal flows. During flood flows, particularly overbank flood flows, there is a tendency for these maximum surface velocities to shift toward that convex bank, and if a particular swale or low is continuous, such as you see here, all of the way across the bar, it is quite easy for that particular swale to be scoured by the flood flow and for a portion of that bar to become detached, as we see there. So you end up with a channel between that detached Point Bar, called a Pointway, and the area which still contains the thalweg, the portion which contains the thalweg and sailing line, which is called the bendway. Once

this happens this can seal itself off in the next flood or, depending on the vagaries of the currents that come down through this area, the shape of the bends upstream, et cetera, et cetera, this Pointway can enlarge, and the detached bar itself can move out toward the central part of the river. As I say, these are not uncommon, these are merely parts of the normal migration, if you will, of a bend."

VII

ARKANSAS' POINT IV IS ESSENTIALLY A RESTATEMENT OF ITS POINT III DEALING WITH THE GEOLOGY OF LUNA BAR

Mississippi feels that she has adequately responded to this position as shown immediately above. Much of the geological data referred to by Arkansas was either compiled under the direction of Dr. Kolb or he participated in it. It would unduly lengthen this Brief to discuss these geological reports and studies in detail, but suffice it to say, Dr. Kolb thoroughly explained them in his testimony. In our opinion, the analysis of the proof introduced by the various geologists as made by the Special Master on Pages 25 through 33 of his Report, could not be improved upon and we would simply adopt it as our response to this position of Arkansas. As the Master pointed out, no cross-examination of Dr. Kolb was attempted and the theory of Mr. Spillers and Dr. Durham was based upon assumption piled upon assumption with no probative testimony to support the assumptions or the theory.

VIII

COMMENT ON THE PRIOR COURT DECISIONS

Mississippi is a little uncertain of the position of Arkansas under Point V of her Brief. Nowhere in the finding of the Special Master is there any indication that he felt himself "bound" by these decisions, nor is there any indication that he was "influenced" by them. It is true that he made reference to the litigation and simply agreed with the Chancellor of Chicot County, Arkansas and the District Judge of the United States District Court for the Northern District of Mississippi, both of whom had previously sustained the position of Mississippi.

We agree with *Durfee* v. *Duke*, 375 U.S. 106, 11 L.Ed.2d 186, 84 S.Ct. 242, cited by Arkansas, which held in essence that litigation between private landowners in either state or federal courts might determine individual property rights of the litigants where a stateline was the boundary, provided that such private litigation was prosecuted to a final unappealable decree. *Durfee* simply says correctly that this private litigation has nothing to do with the ultimate authority of this Court to make the final decision of where the stateline is. That is the position Arkansas and Mississippi find themselves in here.

CONCLUSION

Mississippi submits that the evidence submitted on her behalf was not merely substantial but was overwhelming and establishes conclusively that the state boundary is that recommended by the Special Master. We

respectfully request this Court to adopt and confirm the Report of the Special Master.

Respectfully submitted,

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I, Mitchell Emmett Ward, do hereby certify that a copy of the foregoing Response of the State of Mississippi was served upon the Honorable Jim Guy Tucker, Attorney General of the State of Arkansas, at his usual post office address in Little Rock, Arkansas, and upon the Honorable William H. Drew, Special Counsel to the Attorney General for the State of Arkansas, at his usual post office address at Lake Village, Arkansas, by mailing U. S. mail, postage prepaid, on this the 14th day of June, 1973.

MITCHELL EMMETT WARD